SUBJECT INDEX TO VOLUME 32

The Index comprises a consolidated list of titles of abstracts, compiled from the sectional contents lists of the individual issues.

Within the Sections normally used (**GENERAL, NICKEL, ELECTRODEPOSITION,** etc.), the items are broadly classified in appropriate sub-sections, within which they are, in most cases, entered in the order of their appearance in the Bulletin. The only exceptions to such order are (1) the grouping of the page numbers of serial items and of items of closely related subject matter, and (2) the alphabetical order used in the **GENERAL** and in the **HEAT- AND CORROSION RESISTING MATERIALS: Uses** Sections.

The **Leading Articles** referred to below, although listed separately, are shown also in the appropriate sub-sections in which such articles are differentiated from abstracts by an asterisk at the beginning of the entries.

A list of **Trade-Named Materials and Processes** referred to in this volume appears on pages 392-3.

LEADING ARTICLES

PHYSICAL AND MECHANICAL PROPERTIES OF SOME NICKEL-CONTAINING CORROSION-RESISTING STEELS 104-5

MOND CARBONYL-NICKEL POWDERS 137

GENERAL Page

(See also **General** and **Testing** Sub-sections of other Sections.)

Analytical Chemistry in the Field of Atomic Energy 138
Bright Annealing 71
Cermets: Production, Properties, etc. 65
: Bonding to Metals 38, 69
Diffusion in Metallic Materials 37, 138
Electrical and Thermal Resistivities of Metallic Materials 138
Grain Size: Significance, Determination, etc. 1
Hardness-Conversion Tables 37
Inert-Gas Consumable-Electrode Welding of Thin Materials 71
Investment Casting 170, 186, 223, 263, 359, 366
Metallographic Examination: Recommended Procedures 171
Oxidation of Nickel-containing Materials: Literature Review 138
Physical Properties of Metals and Alloys: Reviews 170, 231
Powder Metals: Production, Properties, etc. 65
: Glossary of Terms 37
: Production of Structural Parts 169
Precipitation from Solid Solution: Educational Lectures 245
Safety Discs 69
Spring Materials 170
Structure of Metals: Current Concepts 209
Testing at Elevated Temperatures: Creep and Stress-Rupture 170, 330
: Proof Stress 138
: Short-Time Tensile 170
Thermal Conductivity: Measurement, etc. 2, 209
Vacuum-Induction Melting 138
(See also **HEAT- AND CORROSION-RESISTING MATERIALS: Production**)
Zone Refining 169

NICKEL Page

Analysis and Determination

Determination by Solvent Extraction 6
Colorimetric Determination 6, 172
Gravimetric Separation of Copper, Nickel and Zinc 6
Determination in Sodium 39
,, ,, Cast Iron 72
,, ,, Brasses and Bronzes 80, 180
Ion-Exchange Procedure 107
Determination in Uranium 107
Analysis of Metals used in Nuclear-Power Plant 138
Determination of Cobalt in Nickel 151
,, ,, Nickel in Nickel-Gold Alloys 172
Removal of Zinc from Ammoniacal Nickel Solution 172
Determination of Sulphur in Nickel Electrodeposits 177
,, ,, Nickel in Ferrites 182
,, ,, ,, ,, Cobalt and Cobalt Salts 211
Spectrophotometric Determination of Cobalt, Nickel, Copper 211
Titration of Metal Acetates in Glacial Acetic Acid 249
Photometric Determination of Nickel in Copper-Nickel 250
Determination by Extraction with Coloured Cations 250
,, of Nickel in Stainless Steels: Fluorescent X-Ray Analysis 276
Magnetometric Titration of Nickel 280

Nickel-Clad Materials: *see* **HEAT- AND CORROSION-RESISTING MATERIALS: Clad, Faced and Lined Materials**

Composition, Properties and **Structure**

(For Influence of Irradiation on Properties, *see* **HEAT- AND CORROSION-RESISTING MATERIALS: Properties,** and **Uses**

Thermal Conductivity 2, 170
Elastic Modulus 4
Diffusion in Nickel and Other Metals 4, 37, 138

Page

Oxidation and Scaling 5, 106, 138, 368
Effect of Rapid Heating on Properties 19
Compatibility with Graphite at Elevated Temperatures 20
Resistance to Liquid Sodium 24
Hardness: Conversion Tables 37
High-Purity Nickel *ex* U.S. Bureau of Mines 38
Specific Heat 38, 170
Corrosion by Sulphuric Acid 39
Anodic Behaviour in relation to Composition 40, 353
Forms of Nickel for Alloying in Steel 48
Bursting Temperature for Safety Discs 69, 70
Graphitically Embrittled Nickel: Recovery 71
Resistance to Hydrochloric Acid, Hydrogen Chloride and Chlorine 89
Passivity Characteristics: Symposium 89
(See also 40, 353)
Ductility: Effect of Creep Strain 106
Creep Properties 106, 210, 230, 264, 349, 368
Magnetization: Effect of Pressure 107
Magnetostriction and Anisotropy in 107, 149
Physical Properties Relevant to Heat Transfer 170
Trace Elements in Nickel: Effect on Properties 171
Internal Ferromagnetic Resonance 172
Electrical Resistance of Sputtered Films 178
(see also 322)
Structure of Metals: Monograph 209
Influence on Beer 210
Resistance to Hydrogen Fluoride 237
Modulus of Rigidity 246
Thermoelectric Stability at Elevated Temperatures 267
Optical Properties 279
Solubility in Beryllium 279
Mechanical Properties 283
Corrosion-Resistance *vis-a-vis* Titanium, Zirconium and other Materials 309
Corrosion-Resistance in Tall-Oil Processing 309
Cathode Nickel for Electron Tubes: Composition 321
Electrical Resistivity 322
Strain-Hardening and Softening: Effect of Chromium 322
Recrystallization of 349

Occurrence, Extraction and Refining

High-Purity Nickel produced by U.S. Bureau of Mines 38
Zone Refining of Nickel 169
Refining of Nickel from American Ores 171
Extraction from Sudbury Ores 209
„ of Nickel and Cobalt: Bibliography 245
Refining of Nickel-Cobalt-Copper Ores: Sherritt-Gordon Methods 245
„ „ Lateritic Ores: Nicaro Process 246, 279
Falconbridge Nickel Mines: History 279

Powder Production, Properties and Uses

(For Nickel and Nickel-Alloy Binders in Cermets, *see* **HEAT- AND CORROSION-RESISTING MATERIALS: Powder Production**)

Terms used in Powder Metallurgy 37
Production and Properties of Nickel Powders: Symposia and Reviews 65, 169
Direct Rolling of Strip from Powder 72, 210
Ground Nickel Powder: Structure 73

Page

*Mond Carbonyl-Nickel Powders 137
Sintering of Tungsten: Nickel and Cobalt Additions 247
Gas Desorption from Powders 280
Carbonyl-Nickel Powder for Cathodes of Electron Tubes 321

Processing (see also **Occurrence, Extraction and Refining,** and **Welding**)

Thermal Regeneration of Oxidized Nickel 5
Recovery Treatment for Graphitically Embrittled Nickel 71
Production of Strip by Direct Rolling of Powder 72, 210
Zone-Refining Treatment 169
Machining: Recommended Practice 181
Fabrication of Tubing 181
Pickling and Acid Dipping 216
Cold Drawing and Annealing: Influence on Rigidity 246
Nickel for Electron Tubes: Processing Technique 321
Thin Foils: Processing for Examination 343
Annealing: Recrystallization Behaviour 349
Polishing and Buffing 376

Specifications and Testing (see also **GENERAL**)

A.S.T.M. Specifications 3
Rapid-Heating Test Methods 19
Hardness Conversion Tables 37
Creep/Ductility Test Methods 106
B.S. Specifications 139, 269
Metallographic Examination 171

Uses (see also **Powder Production and Uses**)

For Uses in Atomic-Power Plant *see* **HEAT- AND CORROSION RESISTING MATERIALS: Uses**

Storage Batteries 6, 247, 349
Heat-Transfer Equipment in Aerothermal Conditions 54
Chemical-Process Industries, General 69, 70, 95, 181
Bursting Discs 69, 70
In Coinage 44, 79, 172, 355
„ Fuel Cells 173
„ Catalysts 173, 280
„ HF Alkylation Units 237
„ Butane-Isomerization Plant 237
„ Electron Tubes 246, 321
„ Vehicles (see also **ELECTRODEPOSITION**) 258
„ Thermocouples 267

Welding

For Chemical Plant 95
Of Tubing 181
Fusion Welding 326
Ultrasonic Welding 338
Welding to Dissimilar Materials 338, 344

Nickel Salts and Compounds
(See also **ELECTRODEPOSITION**)

Nickel Compounds in Storage Batteries: *see* **Uses**
Nickel Oxide in Ferrites: *see* **NICKEL-IRON ALLOYS: Magnetic Properties**

Nickel/Nickel-Chloride System 4
Nickel Oxide: Sintering Properties 5, 210

Page

Photochemical Properties of Nickel Compounds 39
Nickel-Oxide Sinter for Use in Steelmaking 48
Nickel Salts for Plating: D.I.N. Specification 73
Nickel Oxide: Thermal Conductivity 170
Nickel Chloride for Treatment of Wheat Rust 173, 248
Nickel Fluoride: Literature Survey 248
Nickel Oxide: Conversion to Metal: *see* **Occurrence, Extraction and Refining**
Nickel Oxide: Interaction with Methane 280

ELECTRODEPOSITION AND OTHER COATING METHODS

(See also HEAT- AND CORROSION-RESISTING MATERIALS: Clad, Faced and Lined Materials)

Analysis of Solutions

Determination of Additives 75, 141
Analysis of Sulphamate Solutions 108
Determination of Sulphur in Nickel Deposits 177

Electrodeposition of Alloys

Tin-Nickel and other Tin-base Alloys 9, 142
Molybdenum and Molybdenum Alloys 11, 145
Copper-Nickel Alloys 141, 354
Tungsten Alloys 145
Bronze Alloys 142, 303
Nickel-Cobalt and Nickel-Iron Alloys: Pyrophosphate Solutions 176
Nickel-Zinc and Nickel-Thallium Alloys 214
Chromium Alloys: Literature Review 324

Electrodeposition of Nickel, and Properties of Electrodeposited Nickel

Black Nickel Plating 7, 144
Barrel-Plating Techniques 7
Stress in Coatings 8, 42, 107, 141, 214, 355
Porosity in Coatings (see also Quality of Coatings, below) 8 (corrig. 165); 108, 143, 282, 283, 323
Plating of Typewriter Parts 8
„ „ Automobile Hub Caps 8
On Zinc-base Alloys 9, 251, 350
Quality of Nickel/Chromium Coatings: Influence of Chromium and of Underlay 10, 42, 43, 77, 145, 146, 197, 213, 251, 303, 324, 350, 352
Anodic Behaviour of Nickel in Plating Solutions 40, 353
Nickel-Plating Solutions: Review 41
'Kraq-o-lite' Patterned Plating 41, 110
Corrosion-Resistance: *see* Quality of Coatings, above
Nickel-plated Parts for Heat-Transfer in Aerothermal Conditions 54
Nickel Salts for Electroplating: Purity 73
Brightening and Levelling Agents and Techniques 73, 177, 281
Sulphate-Oxalate Electrolytes 75
Structure of Electrodeposited Nickel 75, 282, 353
Distribution of Deposits : Effect of Base 75
Plating of Titanium, Zirconium, Niobium, Tantalum, Molybdenum, Tungsten 78, 175
Resistance of Coatings to Detergents 94
Sulphamate Solutions 107, 108, 141

Page

Bright Nickel Plating: Influence of Age of Electrolyte 140
Nickel Plating of High-Strength Steel: *See* **CONSTRUCTIONAL STEELS: Properties**
Purity of Water used for Electrolytes 144
Nickel and Nickel/Chromium Underlays to Evaporated Aluminium Films 147
Handbook on Nickel Plating 174
Co-deposition of Nickel and Hydrogen 174, 214
Sulphur in Electrodeposited Nickel 177
Fundamental Research in Nickel Plating 211
Plating of Thorium 211
Magnesium-Salt Additions to Electrolytes 212
Nickel Undercoat in Gold-Plating of Molybdenum 215
Engineering Applications of Nickel Plating 215
Nickel-plated Leads for Electron Tubes 246
History of Nickel Plating 250
Pyrophosphate Electrolytes 251
Automatic Addition of Chemicals to Electrolytes 281
Roughness in Deposits 282, 354
Orientation of Deposits: Influence of Chloride 282
Plating of Magnesium Alloys 283
Coatings on Molybdenum 297, 336, 365 (See also 215)
Deposits from High-Chloride Solutions 322
Fatty-Acid Films on Basis Metal 323
Hardness of Deposits: Influence of Wetting Agents 323
Chlorides, Copper, Calcium and Iron: Influence on Deposits 354
Manganese: Influence on Deposits 355

General

Plating of High-Strength Steels: *see* **CONSTRUCTIONAL STEELS, Properties**
Stripping Electrodeposited Coating 43
Electrodeposition of Palladium and Platinum 140
Iron and Chromium Deposits on Copper Single Crystals 143
Electrodeposition of Rhodium 144
Silver Anodes 144
Handbook on Nickel Plating 174
Automatic Addition of Chemicals to Electrolytes 281
Polishing and Buffing Methods 376

Other Coating Methods

(See also HEAT- AND CORROSION-RESISTING MATERIALS: Clad, Faced and Lined Materials)

'Composite Electrochemical Materials': Carbide/Metal Composites 10
Evaporated Nickel-Chromium Films 11
'Kraq-o-lite' (Silicated-Nickel) Process 41, 110
Electroless Plating
Properties and Uses of 'Kanigen' Plating 78
Appraisal of Process 78
Plating of Carbon 144
Handbook on Nickel Plating 174
Addition of Metal Salts to Solutions 212
Undercoatings for Cadmium Plating of Stainless Steel 273
Nickel-Phosphorus Alloy for Brazing Stainless Steel 275
Ceramic Coatings on Nickel-Chromium Alloys 115
Enamelling: Effect of Nickel Flash 109
Anodizing of Aluminium 140
Deposition of Nickel viâ the Carbonyl 141, 252
Paint and Plastic Coatings 144, 302

Page

Evaporated Aluminium Films: Nickel and Nickel/Chromium Underlays 147
Protective Coatings on Molybdenum: *see* **HEAT- AND CORROSION-RESISTING MATERIALS: Properties**
Coating of Stainless Steel to Enhance Wear-Resistance in Nitrogen 301
Coatings to Resist Atmospheric Corrosion: Review 303

Specifications and Testing

A.S.T.M. Specifications for Electrodeposited Coatings 40
Accelerated *vs.* Weathering Tests 43, 109, 146, 251, 302, 323, 350
Thickness of Coatings: Specifications and Tests 43, 79, 177, 213, 214, 251, 302, 350, 351
Nickel Salts for Plating: D.I.N. Specification 73
Porosity: Methods of Measuring 108, 143, 282, 283, 323
Optical Examination of Surfaces and Films 143, 144
Reactions during Chemical Polishing: Methods of Study 144
Nickel/Chromium Coatings: Dutch Specification 174
Brenner and Senderoff Contractometer: Modified Form 214
Nickel-plated Leads for Electron Tubes: Specification 246
B.S. Specifications for Electrodeposited Nickel and Chromium 350
B.N.F. Plating Gauge 351

NON-FERROUS ALLOYS

(See also **HEAT- AND CORROSION-RESISTING MATERIALS**)

Analysis
(See also **NICKEL: Analysis and Determination**)

Gravimetric Separation of Copper, Nickel and Zinc 6
Analysis of Brasses and Bronzes 80, 180
„ „ Alloys used Nuclear-Power Plant 138
Nickel-Gold Alloys: Determination of Nickel 172
Corrosion Products on Copper Alloys: Identification 195
Spectrophotometric Determination of Cobalt, Nickel and Copper 211
Copper-Nickel Alloys: Photometric Determination of Nickel 250

Composition, Constitution and Structure

Grain Size: Significance, Determination 1
Diffusion in Alloys 4, 37, 138, 253
Nickel-Manganese Alloys: Effect of Deformation on Structure 11
Ti_2Ni: Compositional Range 13 (see also 110, 185)
Nickel Alloys for Alloying in Steel 48
(Cobalt)-Nickel-Chromium Alloys: Structure/Magnetic Properties 80
Nickel-Titanium and Nickel-Titanium-Carbon Alloys 110, 185
Nickel-Cobalt-base Alloys of High Damping Capacity 117, 227
Nickel-Aluminium Bronze for Propellers 148
Wrought Cupro-Nickels: Data Sheet 177
Structure of Metals: Monograph 209
Nickel-Copper-Germanium Alloys 216

Page

Ternary Carbides of Nickel with Germanium and Indium 216
Precipitation from Solid Solution: Symposium 245
Solubility of Nickel in Beryllium 279
Copper-Nickel-Manganese Constitutional Diagram 283
Copper-Beryllium Alloys: Effect of Other Elements 325
Nickel-Cobalt Alloy: Recrystallization of 325
Copper-Nickel Alloys: Heats of Formation 325
Nickel-containing Gunmetals: 356
Nickel-Tin Bronze Alloys 356
Influence of Lead in Bronzes and Gunmetals 356

Plating
(See also **HEAT- AND CORROSION-RESISTING MATERIALS: Clad, Faced and Lined Materials**)

„ Molybdenum: *See* **HEAT- AND CORROSION-RESISTING MATERIALS: Properties**
Of Zinc-base Alloys 9, 40, 251, 350
„ Copper-base Alloys 40, 350
„ Magnesium Alloys 283

Powder Production, Properties and Uses

Production of Structural Parts by Powder Metallurgy: Symposium 169
Sintering of Tungsten: Influence of Nickel Addition 247
Sintered Nickel Silver Components 326

Production and Processing

Zinc-base Die Castings: Polishing 9 (see also 40, 350)
Bright Annealing: Furnaces and Atmospheres 71
Processing of Monel Roofing 111, 181
Vacuum-Induction Melting: *See* **HEAT AND CORROSION-RESISTING MATERIALS: Production**
Nickel-Aluminium-Bronze Propellers 148
Zone Refining 169
Wrought Cupro-Nickels: Data Sheet 177
Machining Nickel Alloys 181
Fabrication of Nickel-Alloy Tube and Pipe 181
Pickling and Acid Dipping 216
Cold-Drawing and Annealing: Influence on Rigidity 246
Nickel Silver Spectacle-Frame Wires 253
Founding of Nickel-containing Gunmetals 356
Age-Hardening of Nickel-Tin Bronzes 356
Polishing and Buffing 376

Properties (See also **Specifications**)

Thermal Conductivity 2, 170
Elastic Modulus of Nickel-Copper Alloys 4
Nickel-Chromium Evaporated Films: Physical Properties 11
Nickel-Manganese Alloys: Magnetic Properties 11
Spontaneous Magnetization in Nickel-Copper Alloys 12
Rapid Heating: Effect on Properties 19
Intergranular Cavitation in Stressed Copper-Nickel Alloys 12
Compatibility with Graphite at Elevated Temperatures 20
Behaviour in Wet Oxygenated Steam 21
Corrosion by Hydrofluoric Acid 25
Hardness: Conversion Tables 37
Bursting Pressures of 'Monel' Safety Discs 69, 70

Page

Non-Magnetic Copper-Nickel Alloy 79
Magnetic Properties of (Cobalt)-Nickel-Chromium Alloys 80
Alloys Resistant to Hydrochloric Acid, etc. 89, 237
Magnetization of Nickel-Copper Alloys: Effect of Pressure 107
Heat Capacity of Low-Chromium Nickel-Chromium Alloys 110
Of Monel Roofing 111, 181
Nickel-Cobalt-base Alloys: Damping Capacity 117, 227
: Oxidation 180
: Plasticity 215
: Creep of Single Crystals 349
Oxidation of Nickel Alloys: Literature Review 138
Nickel-Aluminium-Bronze Propellers: Service Records 148
Magnetostriction and Anisotropy of Single Crystals 149
Spring Materials 170
Wrought Cupro-Nickels: Data Sheet 177
'Monel' Alloys and Nickel-Zirconium Alloys: Physical Properties 170
Specific Heat at Low Temperatures: Copper-Nickel Alloys 178
Alloys used in Marine Engineering in U.S.A. 178
Electrical Resistance of Metal Films 178
,, Conductivity of Cast Copper Alloys 179
Gold-Nickel Alloys: Ageing Reactions 179
Wear- and Gall-Resistant Nickel-Copper-Silicon Alloys 180
Nickel-Alloy Tubing 181
Cavitation-Erosion Resistance of 'Monel' 231
Modulus of Rigidity of 'Monel' and Copper-Nickel Alloy 246
Thermoelectric Stability of Nickel-Copper Alloy at Elevated Temperature 267
Mechanical Properties of 'Monel' 283
Corrosion-Resistance of Condenser-Tube Alloys 299
Magnesium Alloys containing Nickel: Resistance to Sea Water 308
Corrosion in Sour-Water Stripping Units 308
Nickel-containing Gunmetals 356
Nickel-Tin-Bronze Sand Castings 356

Specifications and Testing
(See also Plating)

Thermal Conductivity: Measurement 2, 209
Specifications for Nickel Alloys 3, 43, 139, 269
Rapid-Heating Tests 19, 293
Hardness Testing: Conversion Tables 37
Metallographic Examination 171
Wear- and Galling-Resistant Nickel-Copper Alloys: Specification 180
'Monel' Roofing: Data Sheet 181
Nickel-Alloy Tubing: Specifications 181
Leads of Electron Tubes: ,, 246
Tungsten-Nickel-Copper Alloy: ,, 254
Welding of Non-Ferrous Alloys: ,, 326
Non-Ferrous Bourdon Tubing: ,, 328

Uses (See also Properties, and Specifications)

For Uses in Atomic Power Plant, *see* **HEAT- AND CORROSION-RESISTING MATERIALS: Uses**

Coinage 44, 79, 172, 355
Rivets 48
In Petroleum Equipment 59, 236

Page

Bursting Discs 69, 70
Non-Magnetic Alloy for Instrumentation 79
Nickel-Magnesium Alloy for Treatment of Steel 82
Chemical Plant (General) 95, 181, 236, 237, 299, 308
Roofing 111, 181
Marine Propellers 148, 178
Springs 170
Cupro-Nickels: Review of Uses 177
In Marine Engineering: Review 178
Wires for Spectacle Frames 253
Thermocouples 267
Condenser Tubes 299
Soluble Plugs in Sea Water 308

Welding, Brazing and Soldering

Joining of 'Zircaloy' to itself and to Stainless Steel 61, 199, 311, 338
,, ,, Dissimilar Metals 61, 203, 274, 338, 344
Of Nickel-Aluminium-Bronze Propellers 148
,, Nickel Alloys: Recommended Procedure 95, 181
,, Cupro-Nickel Alloys 177
,, Nickel-Alloy Tubing 181
,, Copper to Stainless Steel 203
Fusion Welding of Non-Ferrous Alloys: Current Stage of Development 326

NICKEL-IRON ALLOYS

Analysis

Of Permanent-Magnet Alloys 107, 231
,, Ferrites 182

Composition, Constitution, Structure and Properties
(*excluding* Magnetic Properties, *q.v.*)

Thermal Conductivity 2
Metallographic Examination 17
Solubility of Nitrogen in 39
Martensite Transformation 46, 47
Oxidation Characteristics 111
Spring Alloys 170, 284
Directory of Nickel-Iron-base Alloys 182
Brazing of Graphite to 'Nilo K' 284
Welding to Dissimilar Materials 338, 344

Magnetic Properties and Uses of Magnetic Alloys

Non-Linear Magnetics and Magnetic Amplifiers: Conference 44
Powders: Production, Properties, Uses: Symposium 65
Permanent-Magnet Materials: Stability 80, 149
Magnetic Properties/Temperature Relationships 80, 81, 149, 284, 357
Reversible Permeability: Influence of Mode of Demagnetisation 81
Magnetization: Effect of Hydrostatic Pressure 107
Core Materials 148, 357
Anisotropy and Magnetostriction in Single Crystals 149
Directory of Nickel-Iron Alloys 182
Magnetic Alloys: A.I.E.E. Symposium 216
: Review Data 284

Page

Films in Digital Computers 254
Tape produced by Powder Metallurgy 254
Magnetic Properties: Handbook 357
Magnetic Annealing 358

CAST IRON

General

Grain-Size: Estimation and Significance 1
Erosion and Corrosion in Wet Oxygenated Steam 21
Chill Casting of Ni-Hard Rolls 47
Absorptiometric Analysis of 72
'Ni-Resist'
Properties and Applications: Handbook 112
Oxidation-Resistance 112
Elevated-Temperature Properties 182, 217
Cavitation-Erosion Resistance 231
Resistance to Hydrochloric Acid 237
Austenitic Cast Irons: Specifications 255, 284
In Sour-Water Stripping Plant 308
„ Tall-Oil-processing Plant 309
Growth-, Scaling- and Oxidation-Resistance 112, 150
Purification by Oxidation 150
Cast Irons for Die Blocks 150
Growth and Scaling Tests 150
Metallographic Examination of 171
Elevated-Temperature Properties: Summary 182, 217
Thermal and Elastic Properties of Irons used in Diesel Engines 217
'Ni-Hard' for Grinding Equipment 218, 285, 358
Vibration during Solidification 254
Welding 286

Spheroidal-Graphite Cast Iron

Ductile 'Ni-Resist' : in Oxygenated Steam 21
: Properties and Applications 112
: Oxidation-Resistance 112
Purification by Oxidation 150
Irons for Die Blocks 150
Growth and Scaling Tests 150
Elevated-Temperature Properties 182
Thermal and Elastic Properties of Irons used in Marine Diesel Engines 217
Applications in Steelworks 219
Vibration during Solidification 254
Welding 286

CONSTRUCTIONAL STEELS

Analysis
(See also **NICKEL: Analysis and Determination**)

Determination of Cobalt 151
„ „ Titanium, Zirconium, Niobium and Tantalum 185

Composition, Constitution and Structure
(See also **Specifications**)

For Influence of Composition on Properties of Welds, *see* **Welding**
Forms of Nickel available for Alloying in Steel 48

Page

Steels Deoxidized and Desulphurized with Nickel-Magnesium 82
Influence of Microstructure on Fatigue 112
High-Speed-Tool Steels containing Nickel 113, 185
Ultra-High-Strength Steels: Compositions, etc. *See* **Properties**
Precipitation from Solid Solution: Educational Lectures 245
Steels Vibrated during Solidification: Structure 254
Rotor Forgings: Structure as affected by Composition 256
Temper Embrittlement: *See* **Properties**
Leaded Free-Machining Steels 328
Control of Austenite Grain Size 361

Plating

Cadmium Plating: Effect on Properties, Improved Techniques, etc. 14, 142, 151, 222, 259, 273, 327 (see also 182)
A.S.T.M. Specifications for Electroplated Coatings 40
Effect of Shot Peening prior to Chromium Plating 48
Nickel Plating of High-Tensile Steel 107
Plating of Ultra-High-Tensile Steels: General Notes 182
Nickel- and Chromium-Plating: B.S. Specification 350

Powder Production

Production of Structural Parts from Powders: Symposium 169

Production and Processing
(See also **Plating, Powder Production** and **Welding**)

Peening prior to Plating 48
Nickel for Alloying in Steel: Forms available 48
Bright Annealing 71
Deoxidation and Desulphurization with Nickel-Magnesium 82
Heat-Treatment of Nickel-containing Steels 113, 182, 183
Investment Casting 170
Treatment of Pressure-Vessel Steels 184
Ultra-High-Tensile Steels: Processing 182, 218, 219, 220, 360, 374
Forging and Forgeability: Literature Survey 222
: Effect of Small Reductions on Properties 360
Deformation prior to Transformation 183
Pickling and Acid Dipping 216
Vibration during Solidification 254
Rotor Forgings: Processing of 256
Rolling: Effect of Composition on Spread 256
Nickel-Chromium-Molybdenum Steel Castings: Processing 286
Hot-Cold Working 327
Machining of Lead-containing Steels 328
Investment Casting 359
Ingot Cracking, etc., in relation to Austenite Grain Size 361

Properties and Uses
(See also **Specifications**)

For Uses in Atomic Power Plant *see* **HEAT- AND CORROSION-RESISTING MATERIALS: Uses**

Plating of High-Strength Steels: Effect on Properties 14, 48, 108, 142, 151, 183, 222, 259, 327

Page

Erosion and Corrosion in Oxygenated Steam 21
Corrosion by Liquid Sodium 24
„ „ Hydrofluoric Acid 25
Chromium-plated Steel Shot-peened before Plating 48
Steels used in Petroleum Equipment 58, 59, 196
Bursting Discs 69
Nickel-Copper-Phosphorus Steels: Resistance to Sea Water 82
Ultra-High-Strength Steels:
Fatigue 112, 286, 359
'300-M' Steel 182
Classification and Evaluation 219
For Aeronautical Applications: Symposium 220, 224
Crack Propagation in 257, 259, 287 326
Low-Temperature Properties 287
Alloy-Steel Castings 288, 359
Rapid Heating: Effect on Properties 293
Elevated-Temperature Properties of Cast and Wrought Types 359
Effect of Hot-Cold Working 327
Solidification Conditions and Structure; Effect on Properties 360
9% Nickel Steel for Low-Temperature Service 112
Nickel-containing High-Speed-Tool Steels 113, 185
Compressive, Tensile, Bearing and Shear Properties at Elevated Temperatures 153, 294
Underwater Corrosion in Tropical Regions 160
Deformation prior to Transformation, to Improve Properties 183
Pressure-Vessel Steels 184
Steel for Welded Bridge Construction 185
Forging : Literature Survey 222
: Effect of Small Reductions on Properties 360
Rotor Forgings: Properties 256
Stress-Cycling: Influence on Mechanical Properties 256, 258
Temper Embrittlement: Microstructural Study 257
: Influence of Niobium 258
: Effect on Fatigue 258
: Literature Review 359
: Internal Friction and Brittleness 359
Use in Vehicles 258
Creep: Effect of Environment
See **HEAT- AND CORROSION-RESISTING MATERIALS: Properties**
Impact-Transition Temperature: Influence of Specimen Form 287
Gear Steels for High-Speed Aircraft 288
Materials for High-Temperature Service: Comparison 290
Materials used in Steam Plant: Effect of Service Conditions 298, 372
Corrosion of Constructional Steels: B.I.S.R.A. Report 302
Corrosion by Fumes, Sea Spray and Moisture 303
Brittle Fracture of Forging Steels: Effect of Cracks 326
Machinability of Lead-containing Steels 328
Stress-Corrosion Cracking in Oil-Production Equipment 341
Effects of Radiation on Steels 374

Specifications and Testing
(See also **GENERAL**)

Weldability Tests 15, 205, 328, 329, 361
Hardness Testing: Conversion Tables 37
Testing at Elevated Temperatures
Proof-Stress: Specification 138
Short-Time Tensile and Creep-Rupture 170, 330

Page

Metallographic Examination 171
High-Strength Steels: Test Methods 220
Hot-Twist Test for Forgeability 222
Crack-Propagation Tests 257, 259, 287
(see also Weldability Tests)
Corrosion Testing: B.I.S.R.A. Report 302
Stress-Corrosion Testing 341
Investment Castings in Carbon and Low-Alloy Steels: Specification 359
Grain-Size Determination: Tests 361
(see also 1)

Welding

Cracking in High-Tensile Steel Welds 15, 182, 205, 289, 328, 329, 361
Inert-Gas Consumable-Electrode for Welding Thin Material 71
Welding 9% Nickel Steel 113
„ Carbon and Low-Alloy Steels to Dissimilar Materials 96, 113, 311, 312, 314, 344
Welded Bridge Construction 185
Low-Hydrogen Electrodes: Review 361

HEAT- AND CORROSION-RESISTING MATERIALS

Analysis and Identification

Identification of Chromium-Manganese-Nickel and Chromium-Nickel Steels 99
Determination of Aluminium in High-Temperature Alloys 124
„ „ Cobalt in Stainless Steels 151
Analysis of Nimonic Alloys 151
Determination of Titanium, Zirconium, Niobium, Tantalum, in Stainless Steels 185
Analysis of Corrosion Products on Copper Alloys 195
Sigma Phase: Methods of Identification 224
Identification of Phases: Electron Metallography 224
Determination of Copper in Stainless Steels 231
„ „ Iron, Chromium, Nickel, by Fluorescent X-Ray Analysis 276

Clad, Faced and Lined Materials, including **Sprayed Metals**
(See also **Welding**)

Rapid-Heating Tests of Clad Materials 19
Bonding with Adhesives 19
Stainless-Steel-Clad Steel in Sodium 24
'Inconel X' Sheathing of Space Aircraft 54
Nickel-Alloy Facings in the Petroleum Industry 59
'Brightray'-coated Exhaust Valves 88
Clad Steels, Liners and Overlays in Chemical Plant 96
Clad and Lined Digesters 96, 97
Cladding of Silver/Boron-Carbide Cermets 98
Ceramic Coating of Nickel-Chromium Alloys 115
Sandwich Panels 124, 191, 193
Clad Coatings on Molybdenum 158, 297, 336, 337, 365, 371
Cathodic Protection of Nickel-Lined Tanks 164
Colmonoy 'Sprayweld' Process 198
Clad Steels in Butane-Isomerization Plant 237
Nickel-Chromium-Boron Facing in Sugar Plant 310

Page

Hard Facings: Production, Properties, Uses 310
Graded and Clad Cermets: Nickel-Alloy Cladding 364
Coating of Hot-Work Dies 373

Composition, Constitution and Structure

Nickel-Titanium Alloys 13, 110, 185
Precipitation Phenomena in Nickel-base Alloys 16, 49, 115, 151, 153, 185, 224, 233, 245, 260, 290, 292, 333, 362, 363
Boron and Zirconium in High-Temperature Materials 16, 17, 170, 261, 263, 268, 367, 370
Structural Changes on Rapid Heating 19
„ „ during Creep Testing 49, 113, 335
Nickel-Chromium-Molybdenum-Iron Alloys: Structure 49, 85, 152, 186
'Nicrotung' and 'D.C.M.' Cast Alloys: Composition 53
High-Alloy Castings: Compositions, U.S. Standards 55
'D.319' Austenitic Steel: Composition 55
Lithium in Austenitic Steels 56
(Cobalt)-Nickel-Chromium Alloys: Structure, Addition Elements, etc. 80, 335
Sigma Phase
Nature, Occurrence, Effects 83, 123, 224, 232, 303, 304
Structural Changes on Deformation of Stainless Steel 86
Nickel-Chromium-Cobalt-base Alloys: Recrystallization 86
Electrical-Resistance Materials: Compositions 87, 88
'D-979' Alloy: Composition 115
Nickel-Cobalt Alloys of High-Damping Capacity 117, 227
Solubility of Nitrogen in Austenitic Steels 118
„ „ Hydrogen „ „ „ 194
Stabilizing Elements in Stainless Steels and Alloys: Influence on Precipitation and Properties 119, 292
Diffusion in Metals and Alloys:
Literature Review 138
Iron in Nickel-base Alloys 253
'Nimonic' Alloys: Textbook 151
'Unitemp 212' Precipitation-Hardenable Steel 155
Chromium-Manganese-Nickel and Chromium-Nickel Steels: Comparison 161, 193, 269
Dispersion Hardening in Nickel-base Alloys 185, 366
'Hastelloy-N': Composition 186
Nickel-Aluminium-base Alloys 187, 228, 365
Cast Nickel-Chromium-Iron Alloys: Alloy Casting Institute 'H' series 187
'A.M. 350' and 'A.M. 355' Steels 188
'PH 15-7-Mo' Steel 188
Structure of Metals: Monograph 209
Ultra-High-Strength Stainless Steels: Classification, etc. 219
Investment-Cast High-Nickel Alloys: *See* **Properties** 223
Precipitation-Hardening Casting Steels: 'P.H.-55' series 223
Cast Nickel-Chromium Alloys: Molybdenum Additions 225
'Inconel': Recrystallization and Grain-Growth 226
Nickel-Molybdenum-base Alloys: Modified Composition to Prevent Intercrystalline Corrosion on Welding 233
Precipitation from Solid Solution: Symposium 245
Retained Austenite in Precipitation-Hardening Stainless Steels 260
Chi Phase in Iron-Chromium-Nickel-Titanium Alloys 260
Alloys for Operation at 980°C.: Experimental Compositions 263

Page

Hot-worked Structure: Effect on Creep 264
Uranium or Thorium in Stainless Steel 268
Precipitation in Stainless Steels: Effect on Intergranular Corrosion 270, 271
Strengthening of Nickel- and Cobalt-base Alloys: Solid-solution, carbide- and precipitation-hardening 290
Nickel-Chromium Alloys: Effect of Minor Elements on Structure 292
'Hastelloy B' and 'Hastelloy W' 295
Corrosion of Stainless Steels: Influence of Structure *See* **Properties**
Dislocations in Stainless Steels 300
Low-Temperature Stability of Stainless Steels 301
Controlled-Transformation Stainless Steels: Summary 331
Structure in Relation to Thermal Stability of Hardened Stainless Steels 333
'Inconel X' and 'Incoloy 901': Phase Changes in 335
K State in Nickel-Chromium-base Alloys 336
Deep Drawing: Structural Changes produced by 341
Thin Foils of Steels and Alloys: Structure 343
Single Crystals of Stainless Steel 343
Magnetic Phases in Stainless Steels 343 (see also 301)
Nickel-base Alloys: Review of Status and Future 362
Nickel-Chromium-Iron-Cobalt-base Alloys for Service at 955°C. 362
Cobalt-base Alloys: Review 363
„ „ Casting Alloy 'M.L. 1700' 363
Secondary Phases in High-Temperature Alloys 363
Chromium-base Alloys: Review 365, 368
Molybdenum and Molybdenum Alloys: Review 365, 366
Directional Grain Structure: Effect on Creep-Rupture 370

General

Design of Stainless-Steel Extrusions 165
Cavitation-Erosion: Mechanism 231
Gas Lubrication at High Temperatures 266
Symposium on High-Temperature Materials 362 *et seq*

Plating (For Plating of Cermets, *see* **Powder Production**)

Nickel-plated Structures for Resistance to Thermodynamic Heating 54
Oxidation-Resistant Coatings for Molybdenum 158, 215, 297, 336, 337, 365, 366, 368, 369, 371
Cadmium Plating of Stainless Steel 273
Plated Stainless Steel in contact with Liquid Nitrogen 301
Nickel- and Chromium-Plating of Stainless Steel 350

Powder Production: Properties and Uses of Powder-produced Materials

Terms used in Powder Metallurgy 37
Bonding of Cermets to Metals 38, 69, 98, 363
Production and Processing of Powders and Cermets: Symposia 65, 169
Dispersion-Hardenable Nickel-base and other Alloys 86, 185, 332, 366
Cladding of Cermets with Stainless Steel 98
Nickel-Aluminium-base Alloys 187, 228, 365
Nickel/Titanium-Carbide Cermets 229, 334, 363, 364
High-Temperature Intermetallic Materials: Evaluation of Types 266
Powder Materials: Potential Uses in High-Temperature Service 331
Slip Casting of Stainless Steels 342
Cermets: Problems involved in Development 363

Page

Wettability and Microstructural Study of Liquid-Phase Sintering 364
Cermet Turbine Blading 365
Ceramic-coated Alloys: Spectral Emittance 369

Production and Processing

High-Temperature Ageing of 'Inconel X' 16
Vacuum-Melting and -Casting 17, 82, 115, 138, 187, 335, 362, 363, 366, 367
Nickel: Forms for Alloying 48
Machining of Stainless-Steel Rotor Blades 48
Fabrication of Sheet in 'Nimonic' Alloys and Stainless Steel 52
Processing 'Nicrotung' and 'D.C.M.' 52
Processing of Cast Alloys 'Nicrotung' and 'D.C.M.' 53
Bright-Annealing Stainless Steel 71
High-Temperature Deformation of Austenitic Steel: Equicohesive Temperature 86
Softening Treatments for Stainless Steel 104
Processing Monel Roofing 111, 181
Heat-Treatment of 'D.979' and 'A.F. 71' Alloys 115
„ „ „ 'Nimonic' Alloys 116, 151, 229
Centrispinning High-Temperature Materials 117
Nitrogen Solubility as Production Factor for Stainless Steel 118
Machining of 'Nimonic' Alloys 151, 374
Heat-Treatment of 'Unitemp 212' Precipitation-Hardening Steel 155
'Inconel X': Processing for Aircraft Use 159
Nickel-Molybdenum Alloys: Heat-Treatment 159, 233
Cleaning, Pickling and Passivation of Stainless Steels 162, 197, 216, 310, 342
Extrusion of Stainless Steel 165
Investment Casting of Steels and Alloys 170, 186, 223, 263, 366
Fabrication of High-Nickel Alloys: Recommended Practice 181
„ „ Cast Nickel-Chromium-Iron Alloys 187
Heat-Treatment and Mechanical Working of 'A.M. 350' and 'A.M. 355' 188
Fabrication of Bolts in 'A-286' 189
Precipitation-Hardening Cast Steels 223
Post-Fabrication Heat-Treatment of Sheet and Tube Materials 229
Rolling: Influence of Composition on Spread 256
Hot-Working of Nickel and 'A-286': Effect on Creep 264
Strengthening Treatments for Nickel- and Cobalt-base Alloys: Solid solution, carbide and precipitation hardening 290
Pre-Straining: Effect on Fatigue 292
Cold Working: Effect on Structure and Properties of Nickel-Chromium Alloys 295
Sensitization Treatments for Stainless Steels: TTT Curves 304
Controlled-Transformation Treatments for Stainless Steel 331
Processing Molybdenum and its Alloys 337, 366
Deep Drawing of Stainless Steels: Frictional Effects 341
Thin Foils: Processing for Examination 343
Single Crystals of Stainless Steel: Production of 343
Nickel-base Alloys: Improved Techniques 362
Chromium and Chromium-base Alloys: Improved Techniques 365
Surface Treatment: Effect on Spectral Emittance 369
Press Forging: 'Inconel 713C' Dies 372
: Plated Dies 373
: Press-Forged Castings 373
Polishing and Buffing Procedures 376

Page

Properties

A. Corrosion- and Oxidation-Resistance

Effect of Environment on Creep-Rupture and other Properties 18, 88, 106, 230, 265, 295, 302, 368
Compatibility with Graphite at Elevated Temperatures 20
Erosion and Corrosion in Steam 21, 298
Cast Iron: Corrosion- and Oxidation-Resistance 21, 112, 150, 231, 237, 255, 284, 308, 309
Intergranular Corrosion in Austenitic Steels (See also Stress-Corrosion, below)
Not associated with Carbide Precipitation 22
In Petroleum Refineries 91
Effect of Stabilizing Additions 119
„ „ Sigma Phase 232
Of Nickel-Molybdenum Alloys on Welding 233
Effect of Prolonged High-Temperature Exposure 270, 372
„ „ Precipitation Reactions 270, 271
Apparatus for Testing Susceptibility 272
Of Weldments in Types 304 and 304L Steels 273
„ „ „ 316 and 316L 274
Time/Temperature/Sensitization Curves 304
Inter-relation of Intergranular Cracking and Stress-Corrosion Cracking 374
Stress Corrosion of Austenitic Steels
In Lithium Hydroxide 23, 306
„ Chlorides 56, 305, 374, 375
Of Autoclave Components 57
In Dilute Caustic Solutions 92, 298, 299
„ Hydrochloric-Acid Cleaning Solutions 162
Effect of Notches 340
In Oil-Production Equipment 341
Factors affecting Cracking 374
Cathodic Protection by Applied E.M.F. 23, 164
Corrosion by Liquid Sodium 24, 271
„ „ Hydrofluoric Acid, and Fluorine 25, 236
„ „ Hydrochloric Acid, Hydrogen Chloride and Chlorine 50, 56, 89, 162, 271, 305
Scaling of Nickel-Chromium Alloys 51, 369
Corrosion by Hydrogen Sulphide and Other Corrodents in Petroleum-Refining and Allied Industries 57, 59, 91, 164, 196, 198, 235, 237, 309, 341
„ „ Oil Ash (in Gas Turbines) 88, 195, 227, 339, 340
„ „ Molten Lead: Inhibition by Nickel and Zirconium Additions 89
Passivity in Metals: Colloquium 89
Pitting Corrosion in Stainless Steels 90, 234, 271, 272, 309
Underground Corrosion: Review 91
Corrosion by Nitric Acid
Titanium-Stabilized Steels 92
High-Alloy Steels with and without Stabilizers 120
Attack by Nitric Acid in Presence of Chlorides 121
Huey Test: Critical Discussion 122
Corrosion by Acid-contaminated Cooling Water 93
„ „ Detergents 94
Corrosion- and Oxidation-Resistance of Stainless Steels: Review 118
Oxidation of Metals: Literature Review 138
„ -Resistance of 'Nimonic' Alloys 151
Corrosion by Boron Oxide 156
Oxidation Characteristics of Austenitic Steels 157
„ of Molybdenum and its Alloys: Protective Measures 158, 215, 297, 336, 337, 365, 366, 368, 369, 371
Nickel-Molybdenum-Iron Alloys: Corrosion as affected by Heat-Treatment 159

Page
Underwater Corrosion in Tropical Regions 160
Comparative Corrosion-Resistance of Chromium-Nickel and Chromium-Manganese-Nickel Steels 161, 269
Corrosion by Nitric/Hydrofluoric Acid Solutions 163
„ „ Acids: Evaluation by Three Tests 163
„ „ Hot Gaseous Environments 187
„ „ Sea Water 188
Oxidation-Resistance of Typical High-Temperature Alloys 190
Corrosion by Hydrogen Peroxide 197
„ of Automobile Components (see also ELECTRODEPOSITION) 197
Corrosion-Resistance of Precipitation-Hardening Cast Steels 223
Internal Oxidation in Nickel-Chromium Alloys 227
Oxidation-Resistance of Cobalt- and Nickel-base Alloys, etc. 227
(see also 362 *et seq.*)
Corrosion under Heat-Flux Conditions 230
Cavitation-Erosion Attack 231
Oxidation of Stainless Steels in Aqueous Media: Kinetics of 235
Corrosion in Uranium-Refining Plant 236
„ by Gas Lubricants 266
„ in Steam Plant 298, 299
Wear-Resistance in Liquid Nitrogen 302
Resistance to Atmospheric and to Chemical Corrosion: Reviews 303
Corrosion of Stainless Steel: Effect of Structure 303
„ by Phosphoric Acid 307
Nickel-containing Aluminium Alloys in Hot Water 307, 375
Nickel- or Iron-containing Magnesium Alloys in Seawater 308
Corrosion in Sour-Water Stripping Plant 309
Corrosion-Resistance in Chemical Plant: Titanium, Zirconium, Nickel-base Alloys 309
Properties required in Materials for Reactors 339
Stress-Corrosion Cracking in Copper Alloys 341
Corrosion-Resistance of Passivated Surfaces 342
Symposium on Properties of High-Temperature Materials 362 *et seq.*
(including items relating to Oxidation, e.g. Oxidation of Molybdenum, Oxide Growth on Nickel-Chromium Alloys, etc.)

B. Mechanical and Physical Properties

Thermal Conductivity 2, 209
Of 'Nichrome' Films 11
Of Alloys containing Boron and/or Zirconium 16, 17, 170, 261, 263, 268, 367, 370
Of Vacuum-Melted Alloys 17, 82, 115, 138, 187, 335, 362, 363, 366, 367
Creep-Rupture and Other Properties; Effect of Environment 18, 106, 230, 265, 295, 302, 368
Of High-Chromium Steels: Summary 18
Rapid Heating: Effect on Properties 19, 293
Thermal Fatigue and Related Properties 51, 230, 257, 262, 297
Of Cast Alloys 'Nicrotung' and 'D.C.M.' 53
Nickel-plated Structures for Resistance to Thermodynamic Heating 54
Of 'D-319' Nickel-Chromium-Molybdenum Steel 55
„ Austenitic Steels containing Lithium 56
Safety Discs: Bursting Pressures 69, 70
Magnetic Properties of (Cobalt)-Nickel-Chromium Alloys 80
Page
Creep-Resistance of Austenitic Steels: Comprehensive Study 83
Fatigue, Creep, etc., of Nickel-base Alloys: Russian Research 84
Creep Properties of Nickel-Molybdenum-Chromium-Iron Alloys 85, 152
Electrical-Resistance Materials: Properties and Design Data 87
„ „ „ Increase of Life in Nitrogen 88
Elastic Modulus of Austenitic Steel 89
Physical and Mechanical Properties of Stainless Steels 104
Heat Capacity of Nickel-Chromium Alloys 110
Cast Irons: High-Temperature Properties 112, 150, 182, 217, 231, 255, 284
Creep-Rupture Strength of Austenitic Steel Sheet and Bar 114
Ceramic Coatings: Effect on Creep 115
Of 'D-979' and 'AF 71' Alloys 115
Combined Static and Dynamic Stress: Effect on Properties 115
'Nimonic' Alloys: Typical Properties 116, 151, 229
Effect of Irradiation on Steels and Alloys 116, 302, 339, 374
High-Damping-Capacity Cobalt-Nickel-base Alloys 117, 227
Of Centrispun Parts 117
Stainless Steels: Review 118
Nitrogen Porosity of Stainless Steels 119
Tensile, Compressive, Bearing and Shear Properties of Aircraft Materials 153, 294
Of 'Unitemp 212' Precipitation-Hardenable Steel 155
„ Nickel-Molybdenum-Iron Alloys: Effect of Heat-Treatment 159
„ Spring Materials 170
(see also 116)
„ Investment-Cast Materials 170, 186, 223, 263, 366
Physical Properties relevant to Heat Transfer 170
Of Nickel-Alloy Tube and Pipe 181
„ 'Hastelloy N' 186
„ Nickel-Aluminium-base Alloys: *See* **Powder Production**
„ Cast Heat-Resisting Alloys of A.C.I. 'H' Series 187
„ 'A.M. 350' and 'A.M. 355' Hardenable Steels 188
„ 'P.H. 15-7 Mo' Steel 188, 294
„ Bolts in 'A-286' 189
Creep and Stress-Rupture: Extrapolation of Data 189, 261
Ductility of 'Inconel' Alloys: Effect of Welding Cycle 190
(see also 296)
Of Chromium-Nickel and Chromium-Manganese-Nickel Steels: Comparison 193, 194, 269
Of Sandwich Panels and Honeycomb Structures *See* **Clad, Faced and Lined Materials**
Creep of Nickel: *See* **NICKEL: Properties**
Low-Temperature Properties of Austenitic Steels 195, 196, 287, 301
Ultra-High-Strength Stainless Steels: Classification 219
(see also entries relating to individual hardenable steels)
Precipitation-Hardenable Cast Steels: 'P.H. 55' series 223
Of Materials for Rockets and Missiles 224
„ 'M-252' Blading Alloy 225
„ Cast Nickel-Chromium Alloys: Effect of Molybdenum 225
Post-Fabrication Treatment for Improvement of Properties 229
Emissivity Characteristics of Metals and Alloys 231, 369

Page

Specific Heat of Stainless Steel 231
Crack Propagation in High-Strength Stainless Steels 257, 265
Creep of 'A-286' : Effect of Hot Working 264
Effect of Notches on Creep Strength 265
Thermocouple Materials: Thermoelectric Stability 267
Of Materials for High-Temperature Service: Critical Comparison 290, 331
„ Nickel- and Cobalt-base Alloys Strengthened by Various Means 290
High-Temperature Fatigue: Influence of Pre-Stressing 292
Of Nickel-Chromium Alloys: Influence of Cold Working 295
„ 'Hastelloy B': Influence of Thermal Cycle involved in Welding 296 (see also 190)
„ Steels used in Steam Plant 298
Spectral Reflectivity and Solar Absorptivity 299
Magnetic Properties as Criteria of Low-Temperature Stability 301
Wear-Resistance in Nitrogen Atmosphere 302
Of Controlled-Transformation Stainless Steels: Review 331
Nickel and Nickel-Chromium Dispersion-Hardened with Al_2O_3 332, 333
Thermal Stability of Precipitation- and Dispersion-Hardened Materials 333
Hot Hardness of Nickel-Chromium Alloys 334
Fatigue, Creep, etc., of 'Udimet 500', 'Hastelloy R-235' and 'GMR-235' 334
Creep-Resistance of Nickel-Copper Alloys 334
Elastic Limit of Cobalt-Nickel-Chromium-base Alloys 335
Internal Friction in Nickel-Chromium-base Alloys 336
Austenitic Steels for Reactors: Review 339
Symposium on High-Temperature Materials 362 *et seq.*
Cobalt- and Nickel-base Alloys: Review 362
Nickel-Chromium-Cobalt-Iron-base Alloys: Effect of Addition Elements 362
'Guy Alloy' for Turbine Blading 362
'W-545' Disc Alloy 363
Cobalt-base Alloys : Review 363
„ „ Casting Alloy for Turbine Blading ('ML 1700') 363
Properties in Relation to Secondary Phases 363
Chromium-base Alloys 365, 368
Molybdenum and Molybdenum Alloys: 365, 366, 368, 369
Tungsten, Tantalum, Niobium, Rhenium 366, 369
Dispersion-Hardened Materials 366
Vacuum-Melted and Investment-Cast Materials 366, 367
Effect of Environment: Summaries 368
Fatigue of Typical High-Temperature Alloys 370
Properties in Relation to Directional Grain Structure 370
Creep of Austenitic Steels containing Molybdenum 371
Superheater Tubing after Long Service 372

Specifications

For Nickel Alloys: U.S. 3, 43
: British 139, 269
Stainless Steels: U.S. 55
High-Alloy Cast Materials: U.S. Classifications 55
D-319': Chromium-Nickel-Molybdenum Stee 55
Chromium-Nickel-Steel Castings for Nuclear Applications: U.S. 57
Stainless-Steel Tubing: Internal-Pressure Limits 95
*Stainless Steels: B.S., D.T.D. and A.I.S.I. 104

Page

'Nimonic' Alloys 151
Proof-Stress : Determination at Elevated Temperature: B.S. 138
Spring Materials: British 170
Short-Time High-Temperature Tensile and Creep Testing: A.S.T.M. 170
Metallographic Examination: A.S.T.M. 171
Nickel-Alloy Tube and Pipe: U.S. 181
Bolts and Screws of Age-Hardenable Stainless Steel: S.A.E./A.M.S. 189
Chromium-Manganese-Nickel Steel Bar: A.S.T.M. 194
Non-Magnetic Components in Ships: U.S. Proposals 194
Steels for Use with Concentrated Hydrogen Peroxide: British Defence Specification 197
Filler Wire for Welding Dissimilar Materials: S.A.E./A.M.S. 203, 204
Austenitic Cast Irons : A.S.T.M. and S.A.E./A.M.S. 255, 284
Nickel-Chromium-(Iron) Electrical-Resistance Alloys: A.S.T.M. and British 269
High-Expansion Nickel-Manganese Steel: S.A.E./A.M.S. 288
Vacuum-Melted Austenitic Steel: S.A.E./A.M.S. 290
Precipitation-Hardening Stainless Steel: S.A.E./A.M.S. 290
Vacuum-Melted Nickel-base Alloy: S.A.E./A.M.S. 290
Tubing for High-Temperature Fluid Transport: S.A.E./A.M.S. 297
Materials for Reactors, including Welding Procedure: U.S.A.E.C. Report 302
Stress-Rupture : Determination at Elevated Temperature : B.S. 330
Materials for Bourdon Tubing: B.S. 330

Testing
(See also **Analysis, Specifications**, and **GENERAL**)

Thermal-Conductivity Tests 2, 209
Rapid-Heating Test Methods 19, 293
Effect of Environment in Testing 18, 106, 230, 265, 295, 302, 368
Creep Testing: Structural Changes resulting from 49, 113, 335
Pitting-Corrosion Tests 90, 234, 271, 309
Corrosion Testing: Accelerated and Atmospheric Methods 92, 122, 163, 232, 233, 272, 302
Testing under Combined Static and Dynamic Stresses 115
Proof-Stress Testing at Elevated Temperature 138
Testing of 'Nimonic' Alloys 151
Oxidation Test Methods 158, 190
Short-Time Tension and Creep-Test Methods 170, 330
Metallographic Examination 171
Extrapolation of Creep and Stress-Rupture Data 189, 261
Ductility Testing of Welds 190
Oil-Ash Corrosion Tests: Synthetic Media used, etc. 195, 227, 339, 340
Identification of Corrosion Products on Copper Alloys 195
Welding Tests 205, 328, 377
Electron Metallography: Symposium 224
Thermal-Shock Tests 230
Corrosion under Heat-Flux Conditions: Apparatus and Technique 230
Specific Heat: Test Procedures 231
Cavitation-Erosion Testing 231
Cracking Tests, including Low-Blow Impact 257, 259, 287, 297
Aircraft Gas-Turbine Operation: Simulated Tests 262

Page

Gas-Lubrication Testing 266
Corrosion in Flowing Sodium: Test Procedure 271
'Vidigage' Thickness Tester 272
Fatigue Testing: Prot Test 292
Creep-Testing of Steam-Plant Materials 298
Stress-Corrosion Test Apparatus 305, 306, 341, 375
High-Temperature-Water Testing for Reactor Service 307
Passivation Tests for Stainless Steels 342
Electron Microscopy of Thin Foils 343
Determination of Magnetic Phases in Steels 343
Elevated-Temperature Tests for Cermets 363

Uses

Uses grouped in this sub-section are individually referred to in the **Properties** and **Specifications** sub-sections, in relation to the properties which render the materials suitable for the respective applications.

Aircraft (including Structural Uses, also Rockets and Missiles) 19, 48, 51, 54, 124, 144, 153, 159, 188, 190, 191, 193, 197, 200, 209, 219, 220, 221, 224, 231, 266, 286, 287, 288, 289, 290, 293, 294, 299, 301, 324, 362 *et seq.*, 369, 371, 377
Architecture 94, 111, 181, 303
Atomic Power Plant 20, 21, 23, 24, 25, 39, 57, 61, 85, 98, 107, 116, 121, 122, 138, 152, 163, 170, 186, 190, 199, 204, 209, 226, 229, 236, 248, 268, 271, 295, 296, 302, 305, 306, 307, 308, 311, 322, 339, 374, 375, 376
Bolts 189
Bourdon Tubing 330
Brazing Alloys 62, 199, 275
Bursting Discs 69, 70
Centrispun Parts 117
Chemical Plant (General) 69, 95, 96, 112, 164, 181, 303, 307, 309
Corn-Milling Plant 165
Dies 372, 373
Diesel-Engine Components 217
Domestic Hardware 94
Electrical-Resistance Materials 87, 88, 269
Electronic Equipment 11, 161, 215, 246, 321
Gas Turbines
  Aircraft 17, 52, 151, 200, 201, 225, 229, 262, 263, 266, 269, 290, 291, 293, 294, 297, 362 *et seq.*
  Industrial 20, 52, 53, 88, 89, 151, 195, 227, 269 339, 340, 362 *et seq.*
HF Alkylation Units 236
Non-Magnetic Applications 194
Petroleum and Related Industries 57, 58, 59, 91, 95, 164, 196, 198, 236, 237, 288, 300, 309, 341
Plugs (soluble) in Sea Water 308
Pulp, Paper and Cellulose-processing Plant 96, 97, 272, 308
Railway Engineering 165
Sandwich Structures: *see* **Clad, Faced and Lined Materials**
Springs 116, 170
Steam Plant, including Turbines and Heat Exchangers 60, 93, 96, 117, 227, 270, 298, 299, 305, 311, 312, 314, 371, 372
Sugar Plant 310
Surgical Apparatus 198
Thermocouples 267
Vehicles 258

Page

Welding, Brazing and Soldering, also **Cutting**
(See also **Clad, Faced and Lined Materials**)

Bonding with Heat-Resisting Adhesives 19
  ,, of Cermets to Metals 38, 69, 98
Welding and Brazing 'Nimonic' Alloys and Stainless Steel: Current Practice 52, 98, 104, 151, 237, 376
Nitrogen as Weld-backing Gas 60
Welded Tube Joints in Heat Exchangers 60
Welding to Dissimilar Metals 61, 96, 113, 203, 274, 311, 312, 314, 338, 344
Joining of 'Zircaloy' 61, 199, 311, 338
Nickel-Chromium-Boron and Gold-Nickel Brazing Alloys 62
Inert-Gas Consumable-Electrode Welding of Stainless Steel 71
Welding of High-Nickel Alloys for Chemical Plant 95
  ,, ,, Clad Steel and Liners 96
  ,, ,, Austenitic Steels: Recommended Practice 98, 104
  ,, ,, 'Inconel' Alloys 98, 190
Sigma Phase in Weld Metal 123, 203, 232
Brazing Stainless-Steel Sandwich Panels 124, 191, 193
Welding Nickel-Alloy Pipe and Tube 181
  ,, Precipitation-Hardening Steels 188, 237, 377
Effect of Welding Cycle on Ductility of Parent Metal 190, 296
Brazing Materials: Recent Developments: Palladium Alloys 199
Hydrogen Brazing 200
Wetting Reactions in Brazing 201
Joining Copper to Stainless Steel 203, 274
Welding Niobium-stabilized Steel 203
  ,, 'Inconel' for Nuclear Power Plant 204
Carbon Dioxide *vs.* Argon as Protective Gas 204
Hot-Cracking of Welds: Cast-Pin Tear Test 205
Nickel-Molybdenum-base Alloys: Prevention of Corrosion of Welded Material 233
Corrosion-Resistance of Welds
  Influence of Carbon Content 273
  Of Welds in Molybdenum-containing Stainless Steel 274
Nickel-Phosphorus (Electroless) Alloy for Brazing Stainless Steel 275
Welding of 'Hastelloy' Alloys 296
Welds in Nickel-Chromium-base Alloy: Properties 296
Welding of Materials for Nuclear Reactors 302
Molybdenum and Molybdenum Alloys: Brazing and Welding 338, 365
Ultrasonic Welding 338
Welded Austenitic Steels in Steam Plant 371
Welding of 'Hastelloy' and 'INOR' Alloys 376

Tungsten Arc Cutting of Stainless Steel 275

PATENTS 26, 125, 238, 315

ANALYSIS

See entries in **Analysis** sub-sections

Corrigenda to items in Volume 32

Page 8 Right-hand column, line 6.
For '*Metall*, 1957, vol. 11, pp. 166-7 '
Read '*Metalloberflache*, 1957, vol. 11, pp. 366-7.

„ 71 Left-hand column, line 13.
For '*Metal Treatment*, 1958'
Read '*Metal Treatment*, 1959'

„ 94 Left-hand column, second item.
For *Schweizer Archiv*, 1958, vol. 24, Nov., pp. 335-70.
Read pp. 355-70.

„ 210 Left-hand column, first item.
After 'D. K. WORN' add 'and R. P. PERKS'

Page 230 Right-hand column: title of last item.
For '*Hot-Flux*'
Read '*Heat-Flux*'

„ 245 Left-hand column, line 1.
For 'GRITZLEN'
Read 'FRITZLEN'

„ 275 Left-hand column, line 2.
Delete 'to'

„ 294 Left-hand column: second item, first paragraph.
For '*Nickel Bulletin*, 1959, vol. 32, No. 5, p. 133'
Read '*Nickel Bulletin*, 1959, vol. 32, No. 5, p. 153'

TRADE-NAMES, MATERIALS AND PROCESSES

Referred to in Nickel Bulletin, Volume 32, 1959

16-25-6 Steel
See Timken
17-4 P.H. Steel } *See*
17-7 P.H. Steel } Armco
17-14 Cu-Mo Steel, 192.
17-22A(S) Steel
See Timken
19-9 DL Steel, 192, 363.
40N Cermet, 69.
300-M Steel, 183.
1040 Alloy, 149.
1079 Alloy, 153.
4750 Alloy, 149, 358.

A-286 Steel, 116, 189, 192, 193, 200, 264, 294, 367.
AF-71 Alloy, 115, 241.
Alfenol Alloys, 357.
Alnico Alloys, 67, 217.
Alnico I, II, III and IV, 284.
Alnico V, VI and VII, 149, 284.
Alnico XII, 284.
Alnicro, 20.
Aloyco 20 Steel, 60, 309.
Alphasil, 149.
Alumel, 156, 267.
AM-350 Steel, 188, 193, 231, 237, 287, 293, 299, 331, 338.
AM-355 Steel, 188, 193, 237.
Ampco 8, 309.
Ampco 18, 309.
Andyar Batteries, 247.
A Nickel
See Nickel
Armco 17-4 P.H., 373, 377.
Armco 17-7 P.H., 19, 31, 124, 189, 192, 193, 200, 287, 293, 294, 331, 338, 371, 377.
Armco P.H. 15-7 Mo, 188, 193, 294, 331.
Armex GT Electrode, 371.
ATV Steel, 86.
Audio Transformer A, 357.

Brightray Alloys
B.A.C. Brightray, 88.
Brightray B, 87, 269.
Brightray C, 87, 269.
Brightray F, 87.
Brightray H, 87.
Brightray S, 87, 269.
BTH Leaded Bronze, 21.

C-242 Alloy
See Nimocast
CA Alloy, 246.
Carpenter 20 Steel, 60, 163, 309.
CF-520 Chromium-Plating Solution, 324.
Chem-milling Process, 159.
Chlorimet 2, 55, 309.
Chlorimet 3, 55, 236, 309.
Chromel, 147, 156, 267.
Chro-Mow Steel, 293.
CM1 Cermet, 69.
Coast Metal 50, 192, 336.
Coast Metal 53, 608, 706 and 728, 192.
Colmonoy Alloys
Colmonoy, 59.
Colmonoy 4, 198.
Colmonoy 5, 158, 198.
Colmonoy 6, 28, 31, 68, 158, 198.
Colmonoy 70, 198.
Colmonoy C, 336.
Complexone, 6.
Composite Electrochemical Materials (CEM), 10, 110.
Copnic, 267.
Corrodkote Accelerated-Corrosion Test, 10, 43, 145, 147, 252, 324.
Corronel B, 60, 89.
CR-110 Chromium-Plating Solution, 324.
Croloy Steels, 25.

D-319 Steel, 55.
D-979 Alloy, 115, 241.
DCM Alloy, 53.
Deltamax, 45, 81, 149, 284.
Duomelt Process, 155.
Duovac Process, 155.
Duranickel, 181, 237.
Durichlor, 236, 309.
Durimet 20 Steel, 60, 236.
Duriron, 236, 309.
Dynamax, 149.

Efco-Udylite 4 B1H Barrel-Plating Solution, 8.
Efco-Udylite No. 31 Plating Solution, 140.
Elinvar, 217.
EME Steel, 21.

Ferramic H and H-1, 149.
Ferry, 87, 269.
TC Ferry, 87.
F. Nickel
See Nickel
F.V. 520 Steel, 186, 331.
F.V. 548 Steel, 371.
F.V. 555 Steel, 371.

G-18B Steel, 83, 223, 370.
G-32 Steel, 370.
G-34 Steel, 223.
G-39 Steel, 223.
G-42B Steel, 28.
G-64 Casting Alloy, 69, 83.
Girbotol Process, 60.
GMR-235 Alloy, 83, 223, 334, 363, 366, 367.
GMR-235D Alloy, 116.
G Nickel
See Nickel
Gunite, 309.
Guy Alloy, 17, 83, 154, 263, 335, 362, 363, 366.

Hastelloy Alloys, 68, 164.
Hastelloy A, 237.
Hastelloy B, 55, 60, 85, 163, 186, 209, 230, 237, 295, 296, 259, 302, 309, 376.
Hastelloy C, 55, 60, 163, 165, 209, 236, 267, 302, 309, 338, 369.
Hastelloy D, 60, 309.
Hastelloy F, 309.
Hastelloy N, 186.
Hastelloy R-235, 191, 209, 231, 267, 297, 334.
Hastelloy W, 191, 295, 312, 376.
Hastelloy X, 363.
Haynes Stellite Alloys (*See also* Hastelloy)
Stellite 1, 21.
Stellite 6, 21, 236.
Stellite 21, 209, 267, 363.
Stellite 25, 116, 157, 163.
Stellite 31, 17, 223, 335, 363, 370.
Stellite 98M2, 267.
Stellite Star J, 267.
General, 65, 316.
He 1049 Alloy, 17, 335.
Heliarc Process, 237.
Hi-C Super-Hy-Tuf Steel, 222.
High Perm 49, 149.
Hipernik, 81, 149, 284.
Hipernik V, 81, 149, 284.
Hipersil, 149.
H Monel
See Monel
HR Crown Max Steel, 223.
HS-220 Steel, 221.
HS-1049, 363.
HTC Nickel
See Nickel
HY-65 Steel, 184.
HY-80 Steel, 184.
Hymu-80, 45, 81, 149, 284.
Hy-Tuf Steel, 221.

Inco 700, 338, 366.
Inco 702, 369.
Inco 713, 83.
Inco 803, 236.
Inco 901, 224.
Incoloy Alloys
Incoloy, 181, 309, 372.
Incoloy 804, 309.
Incoloy 901, 335.
Incoloy T, 181.
Inconel Alloys
Inconel, 3, 20, 25, 55, 60, 85, 89, 156, 157, 163, 170, 181, 186, 189, 190, 191, 200, 204, 226, 228, 230, 236, 267, 269, 272, 302, 308, 309, 312, 336, 337, 338, 344, 368, 369, 370, 372.
Inconel 550, 51, 297.
Inconel 700, 297, 363.
Inconel 702, 157, 191, 200.
Inconel 713C, 372.
Inconel S, 181, 267.
Inconel X, 16, 20, 25, 54, 98, 116, 154, 159, 170, 181, 190, 191, 224, 225, 231, 267, 299, 331, 335, 338.
Inco-Weld A, 312, 314.
Inductovac Process, 155.
INOR-8, 86, 152, 230, 302, 376.
(*See also* Hastelloy N)

J-1570 Alloy, 200, 297, 367.

K-152B } *See*
K-162B } *See*
K-163B } *See*
K-164B } Kentanium
K-183A } Kentanium
K-196 } Kentanium
Kanigen Electroless Plating Process, 78.
Kanthal, 65.
KEL-F Elastomer, 21.
Kennametal, 229.
Kentanium Cermets
K 152B, 364, 365.
K 162B, 267, 364.
K 163B, 69.
K 164B, 364.
K 183A, 69, 364.
K 196, 364.
K Monel
See Monel
Kovar, 338, 344.
Kraq-O-Lite Plating Process, 41.

L-605 Alloy, 200.
Langalloy 20V, 60.
Lansin, 9.
LC and LM Nicrobraz, 192.
L Nickel
See Nickel
L.P.D. Steel, 288.
L-Silectron, 357.

M-1 Steel, 267, 288.
M-50 Steel, 288.
M-252 Alloy, 83, 154, 225, 262, 297, 362, 363, 367, 368.
M-730 Plating Addition, 141.
Magnesil, 45, 149.
Matrix M2 Steel, 288.
Mischmetall, 15.
ML-1700 Alloy, 363.
Monel Alloys
Monel, 2, 3, 21, 25, 32, 49, 55, 57, 59, 60, 69, 70, 87, 89, 95, 111, 129, 142, 153, 163, 170, 178, 181, 231, 236, 237, 246, 269, 308, 309, 316, 337.
Monel 402 and 403, 181.
H Monel, 181, 269.
K Monel, 59, 170, 181, 269.
R Monel, 3, 181.
S Monel, 59, 181, 269.
Multimet Alloy, 267.
(*See also* N-155)
Mumetal, 149.

220 Nickel } *See*
225 Nickel } *See*
499 Nickel } Nickel
N-155 Alloy, 157, 225, 367, 369, 370.
Nibrite, 8.
Nichrome, 11, 65, 297, 316, 336, 362, 369.
Nichrome V, 18, 20, 170, 191, 337.
Nickel
220 Nickel, 321.
225 Nickel, 321.
499 Nickel, 321.
A Nickel, 3, 25, 87, 170, 181, 264, 321.
F Nickel, 48.
G Nickel, 181, 267.
HTC Nickel, 87.
L Nickel, 267.
P-50 Nickel, 321.
S Nickel, 181.
Nicral D, 86.
Nicrobraz 10, 50 and 60, 192.
Nicrotung, 53.
Ni-Hard, 47, 218, 358.
Nilo-K, 284.
Nimocast Alloys, 152.
Nimocast 90, 223.
Nimocast 242, 83, 223.
Nimocast 258, 69, 223.
Nimonic Alloys
Nimonic 75, 20, 52, 60, 157, 181, 237, 269, 340, 344, 374.
Nimonic 80, 20, 269, 362, 374.
Nimonic 80A, 20, 52, 83, 227, 237, 261, 269, 340, 374.
Nimonic 90, 20, 28, 31, 52, 69, 170, 230, 237, 260, 261, 269, 363, 374.
Nimonic 95, 69, 237, 374.
Nimonic 100, 20, 69, 83, 237, 374.
Nimonic 105, 374.
Nimonic DS, 60.
General, 65, 116, 151, 229, 336, 343, 370, 376.
Ni-O-Nel, 60, 163, 181, 309.
Ni-Resist, 112, 308, 309.
Type 1, 231, 237.
Type 2, 231.
Type 3, 21, 231.
Ni-Span C, 170.
Nitralloy Steel, 21.
Nitralloy N Steel, 288.
Nivco, 227.
Ni-Vee Type A, 356.

Orthonik, 149.
Orthonol, 45, 149, 358.

P-50 Nickel
See Nickel
Paralloy 20 Steel, 60.
Peerless 56 Steel, 293.
Peerless J Steel, 222.
Peraluman, 94.
Permalloy Alloys, 45, 46, 65, 81, 149, 284, 316, 358.
Permeron, 149.
Perminvar Alloys, 316, 358.
Petro-bond Sand Binder, 178.
P.H. 15-7 Mo Steel
See Armco
PH-55 Steels, 223.
Polypor Materials, 350.
Pyro-Plate Process, 373.
Pyro-Tung Process, 373.

R-235 Alloy, 157.
Raney Cobalt Catalyst, 125.
Raney Nickel Catalyst, 125.
Refractaloy 26, 370.
René 41 Alloy, 200.
R Monel
See Monel
Rokide A, 299.

S-590 Alloy, 370.
S-816 Alloy, 51, 223, 225, 262, 292, 297, 338, 362, 363, 370.
SCA-100 Cermet
Silectron, 149.
S Inconel
See Inconel
S Monel
See Monel
S Nickel
See Nickel
Sprayweld Process, 198.
Stainless W Steel, 331.
Stellite Alloys
See Haynes Stellite
Stupalith, 179.
Super Gleamax Bright-Nickel - Plating Solution, 9, 140.
Supermalloy, 45, 81, 149, 284.
Supermendur, 149, 357.
Super Tricent Steel, 222.

T-1 Steel, 184.
TC Ferry
See Ferry
Teflon, 236.
Thermenol Alloys, 68, 357.
Thermold J Steel, 14, 293, 294.
Timken 17-22A(S) Steel, 294.
Timken 16-25-6 Steel, 224, 292, 338.
Tran-Cor 3X, 149.
Transformer-A, 357.
Tricent Steel, 221, 287.

Udimet-500, 83, 153, 154, 334, 362, 363, 367, 369.
Udylite Bright - Nickel Additions 41 and 2RL 8.
UI 117-50 Ceramic, 19.
Unionmelt Welding Process, 96.
Unitemp 212 Steel, 155, 331.
U.S.S. Strux Steel, 222.
Utimet 500, 17, 335

Vac Cad Process, 259.
Vascojet 1000 Steel, 222.
Vitallium, 370.
Vycor, 11, 179.

W-545 Alloy, 335, 363.
Waspaloy, 83, 154, 367, 368.
WF-176 Steel, 223.
Worthite Steel, 60, 309.

X-50 Alloy, 335.
X-63 Alloy, 335.
X-8001 Alloy, 375.

Z-Silectron, 357.
Zircaloy, 61, 138.
Zircaloy 2, 199, 311, 338
Zircaloy 3, 200.
Zonax Bright Chromium Plating Solution, 9.

An up-to-date list of addresses of publishers of the periodicals mentioned in The Nickel Bulletin has been printed and we shall be pleased to send a copy to readers on request.

NAME INDEX TO VOLUME 32

Abrahamson, E. P. 365, 368.
Achter, M. R. 18, 106, 368.
Acker, J. T. 321.
Adams, G. R. 119.
Adams, W. S. 218.
Adès, L. 8.
Aggen, G. N. 188.
Ahearn, P. J. 288.
Ahern, S. A. 12.
Aitken, A. McL. 78.
Alexander, A. L. 160.
Alfonsi, B. 180.
Almqvist, G. 97.
American Electroplaters' Society, 42, 282, 283, 323, 327.
American Institute of Electrical Engineers, 44, 216.
American Society of Mechanical Engineers, 231.
American Society of Metals, 220, 245, 357.
American Society for Testing Materials, 3, 18, 37, 40, 44, 170, 171, 177, 182, 194, 213, 215, 224, 246, 254, 255, 269.
Amy, J. A. 16, 153, 224.
Anderson, J. C. 172.
Anderson, R. V. 60.
Anderson, W. A. 245.
Andrews, C. R. 156.
Antill, J. 67.
Arant, N. R. 47.
Arbuzov, M. P. 322.
Armstrong, T. N. 112.
Arrott, A. 357.
Arrowsmith, D. J. 8.
Atkinson, R. H. 140.
Atomic Energy of Canada, Ltd. 2.
Ault, G. M. 362.
Averbach, B. L. 260, 357.
Avraamov, Y. S. 336.

Babcock and Wilcox Company, 24.
Backensto, E. B. 57, 164.
Bacon, F. T. 173.
Bacon, R. A. 354.
Badger, F. S. 186.
Baerlecken, E. 299.
Balajiva, K. 196.
Baldwin, W. M. 51.
Ball, F. A. 98.
Ball, R. E. 45.
Bamberger, E. N. 200.
Bane, R. W. 138.
Banerjee, B. C. 75, 282.
Barker, R. C. 45.
Barraclough, S. 58.
Barrett, B. R. 245.
Barrett, C. A. 51.
Barton, J. W. 13.
Bastien, P. 343.
Battelle Memorial Institute, 9, 23, 25.
Beach, J. G. 211.
Beachem, C. D. 257.
Beacom, S. E. 177, 281.
Beamer, P. W. 366.
Bean, C. P. 357.
Beatson, E. V. 199.
Beauvais, C. 343.
Beck, F. H. 90, 305.
Becker, J. J. 357.
Beeskow, H. 353.
Belser, R. B. 178.
Belvedere, C. 224.
Belyakov, L. N. 336.
Benes, R. 165.
Benesovky, F. 67.
Benham, R. R. 140.
Bennett, D. G. 19.
Bennett, H. H. 236.
Bennett, J. A. 112.
Bernshtein, M. L. 292, 295.
Berry, J. 373.
Berry, J. M. 267.
Bertocci, U. 90.
Betteridge, W. 116, 151, 229.
Bever, M. B. 325.
Bhattacharyya, S. K. 173.
Bieber, C. G. 245.
Bigelow, W. C. 16, 153, 224.
Biggs, B. L. 361.
Binder, W. O. 119.
Birchenall, C. E. 37.
Birks, L. S. 225.
Bittmann, E. E. 254.
Blackie, M. S. 280.
Blanchard, J. R. 158.
Blanchard, R. 194.
Bloch, L. 172.
Blundy, P. D. 6.
Bobeck, A. H. 46.
Bockris, J. O'M. 211.
Bollman, W. 349.
Borachia, P. 256.
Borodkina, M. M. 284.
Borrmann, G. H. 306.
Bott, H. B. 203.
Bowers, J. E. 356.
Bransom, S. 280.
Braun, M. P. 258.
Braun, W. J. 25.
Bray, R. S. 245.
Brien, R. E. 112.
Brindley, W. F. 56.
Brinkman, J. A. 322.
British Cast Iron Research Association, 1, 72, 150.
British Iron and Steel Research Association, 151.
British Non-Ferrous Metals Research Association, 1, 214, 351, 356.
British Standards Institution, 138, 139, 330, 350, 359.
British Steel Castings Research Association, 1.
British Welding Research Association, 328, 329.
Britton, S. C. 108, 143.
Brockway, L. O. 16, 224.
Brody, J. K. 138.
Brooks, E. J. 225.
Brooks, W. B. 374.
Brown, B. F. 259, 340.
Brown, J. F. W. 70.
Brown, J. T. 53, 335, 363.
Bryan, W. T. 55.
Bückle, C. 185.
Buckley, D. H. 266.
Buhr, R. K. 359.
Bukina, V. K. 177.
Bukowiecki, A. 94.
Bulina, J. 335, 363.
Bullock, G. 109.
Bunce, B. E. 7.
Bungardt, K. 83, 119, 159, 292.
Bünger, J. 120.
Burbank, R. D. 358.
Burkhardt, W.
Burling Smith, W. J. 198.
Burrows, C. F. 191, 193.
Burt, R. R. 114.
Bush, G. H. 108.
Busk, R. S. 245.

Caldwell, M. R. 251.
Calvert, L. D. 111.
Cameron, J. A. 112.
Campbell, J. E. 287.
Campbell, T. T. 145.
Canavan, H. M. 272.
Capel, L. 96.
Caplan, D. 157.
Carius, C. 90.
Carius, W. 235, 236.
Carlson, R. L. 287.
Carr, D. S. 54.
Carr, W. J. 357.
Carroll, K. G. 224.
Carruthers, M. E. 274.
Casey, A. T. 249.
Casey, F. W. 334
Cash, D. J. 151.
Castell, H. C. 41.
Castleman, L. S. 4.
Cataldi, H. A. 21.
Catterall, J. A. 209.
Cels, J. P. 174.
Chamblin, V. C. 6.
Chang, B.-C. 283.
Chang, W. H. 61.
Char, T. L. R. 176, 251.
Chaybany, A. 354.
Cheng, C. F. 21.
Child, H. C. 82.
Cibula, A. 1.
Clancy, W. P. 258.
Clark, C. C. 335.
Clark, C. L. 372.
Clark, J. J. 80, 284.
Clarke, M. 108, 143.
Clarke, W. E. 72.
Class, J. 311.
Clausing, R. E. 376.
Clauss, F. J. 51.
Cochardt, A. 117, 227, 333, 357.
Cohen, B. 14, 48.
Cohen, M. 111, 157.
Coldren, A. P. 264.
Committee for Standards, Measures and Measuring Instruments, Council of Ministers of U.S.S.R. 214.
Conger, R. L. 46.
Conrad, H. 261.
Contractor, G. P. 222.
Conway, B. E. 211.
Copson, H. R. 227.
Cordero, H. G. 172.
Cordovi, M. A. 372.
Corey, C. L. 224.
Corner, W. D. 107.
Couzy, J. 247.
Crussard, C. 86.
Crystal, H. 109.
Cubicciotti, D. 4.
Culbertson, R. P. 95, 310.
Cunningham, D. E. J. 144.
Cunningham, J. W. 335.
Cuthill, J. R. 115

Dale, J. J. 140.
Dandy, A. 280.
Danielson, E. 2.
Darmara, F. N. 138.
Dassarmo, B. 172.
Davey, P. 2.
Day, M. J. 118.
De Blois, R. W. 357.
Decker, R. F. 16, 367, 370.
Dedman, H. E. 293.
Defranoux, J. M. 309.
De Gromoboy, T. 144.
Deissler, R. 2.
Dell, R. M. 5.
Deutsch, G. C. 365.
Deutscher Normenausschuss, 73.
Dhosi, J. M. 183.
Dickinson, T. A. 78.
Dietz, G. 90.
Dietz, J. K. 220.
Diran, L. M. 99.
Disam, A. 353.
Dixon, R. H. T. 150.
Domnikov, L. 273.
Donoghue, H. G. 218.
Donovan, B. 172.
Donovan, M. 67.
Douglas, D. A. 226, 229, 295, 368.
Downey, R. C. 337.
Droegkamp, R. E. 199.
Dubpernell, G. 250.
Ducret, L. 250.
Dudek, R. F. 24.
Du Rose, A. H. 146.
Dyrkacz, W. W. 367.

Eberle, F. 290.
Ebling, H. F. 304.
Edeleanu, C. 22.
Edwards, J. 140.
Eian, C. 2.
Eisenhauer, J. J. 366.
Eisenkolb, F. 187.
Ek, C. H. 115.
El-Gendi, S. 212.
Elliott, C. R. 231.
Elman, I. B. 99.
Elser, F. 352.
Emmons, W. F. 193.
Engl, A. 298.
England, L. J. 250.
Engle, J. P. 162.
Epner, M. 185.
Ergang, R. 83.
Erikson, S.-E. 97.
Ernst, D. W. 11, 282, 283, 323.
Esmore, L. H. 140.
Etter, R. W. 215.
Evans, E. B. 51.
Evans, R. M. 302.
Evans, T. E. 121.
Everest, A. B. 219.
Everett, L. H. 138.
Everhart, J. L. 118, 169.

Fabian, R. J. 284.
Fanner, D. A. 107, 141.
Farago, F. 221.
Faulkner, W. H. 245.
Faust, C. L. 9.
Fedotov, I. D. 4.
Feduska, W. 201, 311.
Feisel, D. H. 333.
Ferguson, K. M. 24.
Ferguson, R. R. 159.
Ferré, S. 228.
Fieldhouse, I. B. 209.
Fink, F. W. 25.
Finsen, J. E. 272.
Fisher, A. O. 230.
Fisher, J. I. 286.
Fishlock, D. J. 259.
Fitzer, E. 228.
Fitzgeorge, D. 217.
Flemings, M. C. 360.
Flinn, R. A. 268, 366.
Flint, G. N. 233.
Floreen, S. 325.
Florence, T. M. 39.
Floyd, G. L. 162.
Fontana, M. G. 90, 91, 305.
Forgeson, B. W. 160.
Forsyth, F. R. 248, 249.
Fountain, R. W. 245, 365.
Fragetta, W. A. 204.
Frank, R. G. 224, 366.
Frankel, H. E. 112.
Franklin, T. C. 144.
Frazier, R. 2.
Freche, J. C. 263.
Freeman, J. W. 16, 51, 224, 264, 367, 370.
Frey, S. S. 41.
Friedberg, S. A. 178.
Friedl, B. E. 25, 303.
Fritz, J. F. 80, 284.
Fritzlen, G. A. 245, 363.
Frohberg, M. G. 39.
Frohlich, H. P. 248, 249.
Fry, H. 214.
Fusner, G. R. 225.

Galonian, G. E. 23, 306.
Gardner, M. 67.
Garofalo, F. 114, 265.
Gegner, P. J. 309.
Geiger, T. 260.
Gelles, S. H. 279.
Geneidy, A. 212.
General Electric Research Laboratory, 267.
Genty, B. 185.
Gerasimoff, P. 228.
Gerds, A. F. 20.
Gilbert, G. N. J. 150.
Gilbert, P. T. 299.
Gill, E. T. 196, 288.
Girard, R. G. 78.
Gittus, J. H. 254.
Glassick, C. E. 249.
Glenny, E. 68, 230.
Glicksman, R. 6.
Goetzel, C. G. 86, 185, 364.
Gold, V. 280.
Goldberg, D. C. 337.
Goldman, J. E. 178, 357.
Goodenough, J. B. 357.
Goodman, S. 221.
Goodwin, P. S. 79.
Goodwyn, J. 144.
Gorin, E. 173.
Goswami, A. 75, 282.
Gottwald, H. 256.
Gould, J. E. 80.
Gould, J. V. 328.
Gouwens, P. 373.
Graf, H. 39.
Gräfen, H. 271.
Graham, C. D. 357.
Graham, W. F. 195.
Grant, N. J. 332, 365, 368.
Gray, P. S. 340.
Grazen, A. E. 110.
Greathouse, W. D. 341.
Green, R. 360.
Greenblatt, J. H. 308.
Greene, N. D. 90, 91.
Greenwood, J. N. 12.
Gregory, E. 86, 185.
Grinthal, R. D. 266.
Gross, J. H. 112, 184.
Gross, M. R. 194.
Grosse W. 256.

Grunwald, J. J. 323.
Guard, R. W. 370.
Gudtsov, N. T. 292,
Gugan, D. 107.
Günther, G. 83.
Guthrie, G. L. 178.
Gyorgak, C. A. 297.

Haefner, K. 269.
Hague, J. L. 185.
Hahn, R. 11.
Hall, N. 213.
Hall, R. C. 149.
Hamaker, J. C. 220.
Hammond, C. M. 366.
Hammond, R. A. F. 107, 141.
Hamstead, A. C. 161.
Harpur, C. E. 218.
Harris, G. T. 82.
Hartbower, C. E. 112, 259.
Harwood, J. J. 290, 331, 365.
Hatch, W. P. 112.
Hausner, H. 342.
Hawkes, P. E. 115.
Hayes, P. A. 121.
Heavens, O. S. 143.
Hehemann, R. F. 113, 185, 362.
Heidenreich, R. D. 358.
Hempel, M. 370.
Henneke, H. 312.
Hibbs, L. E. 107, 172.
Hicklin, W. H. 178.
Higgs, D. G. 108.
Hill, R. M. 147.
Hinde, J. 95.
Hines, J. G. 23.
Hoar, T. P. 8, 23.
Hogan, C. 2.
Hoke, J. H. 290.
Holmes, K. D. 288.
Holsinger, F. J. 165.
Holt, M. L. 11.
Holzworth, M. L. 163.
Hoofdcommissie voor de Normalisatie in Nederland, 174.
Hopkinson, B. E. 204.
Hoppin G. S. 200, 338.
Houk, W. W. 276.
Hovorka, F. 174.
Howell, I. J. 140.
Hudson, F. 178.
Hudson, J. C. 302.
Hughes, H. 261.
Hugo, J. P. 57.
Hull, F. C. 205.
Hultgren, R. 110.
Humenik, M. 364.
Huntington, J. S. 138.
Hutchinson, F. 107.
Hütter, L. J. 216.

Ibragimov, S. S. 336.
Iida, Y. 5, 210.
Ilschner-Gensch, C. 5.
Institute of British Foundrymen, 1.
Institution of Metallurgists. 209.
International Nickel Company, Inc. 3, 7, 43, 111, 112, 159, 174, 181, 182, 185, 228.
Iron and Steel Institute, 302.
Irvine, K. J. 331.
Iske, F. W. 82.
Iwanski, J. S. 335.

Jackson, E. G. 288.
Jackson, R. C. 81.
Jackson, R. E. 46.
Jackson, W. J. 1.
Jacobs, W. D. 211.
Jaffee, R. I. 336.
Jech, R. W. 366.
Jellinghaus, W. 80.
Jenkins, I. 65.
Johnson, J. W. 4.
Johnson, R. L. 266, 301.
Johnston, J. R. 261, 262, 297, 362.
Jonassen, H. B. 6.
Jones, C. A. 245.
Jones, D. 308.
Jones, H. N. 122.
Jones, J. B. 338.
Jones, M. H. 42.
Jones, P. W. 328.
Jones, R. A. 224.
Jones, T. E. M. 329.

Kaddou, A.-F. K. 359.
Kaltenhauser, R. H. 237.
Kaminskii, E. Z. 86.
Kanter, J. J. 269.
Kape, J. M. 140.
Kato, T. R. 236.
Kattus, J. R. 19. 182, 293, 294.
Kaufmann, A. R. 279.
Keil, H. L. 248, 249.
Keller, J. D. 47.
Kelley, C. M. 4.
Kelly, J. F. 195.
Kennedy, C. R. 295.
Kennedy, E. M. 14.
Kennedy, S. W. 111.
Kieffer, R. 67.
Kikeli, P. S. 221.
King, P. P. 275.
King, R. 2.
Kingery, W. 2.
Kirkby, H. W. 371.
Klier, E. P. 221.
Kloos, K. H. 341.
Kneller, E. 11.
Kobayashi, H. 90.
Koch, W. 49.
Kochanovska, A. 73.
Kochendörfer, A. 46, 47.
Koehler, W. A. 212.
Kollrack, R. 260.
Kolotyrkin, Y. M. 90.
Kondrashev, A. I. 258.
Konev, Y. K. 336.
Kononenko, N. I. 177.
Konstantinova, G. S. 283.
Korchynsky, M. 365.
Kraft, R. W. 268.
Kramer, D. 106.
Kramer K. H. 256.
Krauss, G. 260.
Krijn, G. C. 6.
Krisch, A. 49.
Kriutchkov, N. F. 4.
Krivobok, V. N. 94.
Kropschot, R. H. 195.
Krulikovskaya, M. P. 322.
Kula, E. B. 183.
Kushner, J. B. 42.
Kwiatkowski, Z. 75, 141.

Lahr, A. F. 269.
Lainer, V. I. 283.
Lam, D. G. 229.
Lan, C. 110.
Lang, F. S. 227.
Lang, J. I. 231.
Langenberg, F. C. 118.
Lanzara, A. A. 124.
Larrabee, C. P. 82.
Lavendel, H. W. 364.
Lawthers, D. D. 368.
Leach, J. S. Ll. 325.
Lechnick, W. 89.
Lee, E. W. 81.
Lee, W. T. 142.
Lefort, H. G. 19.
Leggett, R. D. 343.
Lena, A. J. 245.
Lenel, F. V. 366.
Lennartz, G. 119, 292.
Lents, R. O. 296.
Lessley, H. L. 294.
Levick, R. 237, 376.
Levinstein, M. A. 297, 336.
Levy, C. 324.
Lewis, C. F. 222.
Lewis, L. 98.
Leyda, W. E. 290.
Liebson, M. 274.
Linde, D. 2.
Linden, H. 312.
Lindh, G. 96, 344.
Linford, H. B. 323.
Linnert, G. E. 203.
Livshits, B. G. 336.
Llewellyn, D. T. 331.
Llewelyn, D. T. 261.
Lockington, N. A. 142.
Löfblad, B. 96, 344.
Logan, H. L. 339.
Lorenz, K. 299.
Lowry, L. 342.
Lozier, G. S. 6.
Lula, R. A. 188.
Lund, J. A. 72.
Lundsten, R. H. 357.
Lux, B. 335.
Luykx, J. M. M. 210.
Lyon, C. B. 248.

Machlan, L. A. 185.
Machlin, E. S. 106, 138.
Machu, W. 212.
Mackay, W. B. F. 219.
Mackiw, V. N. 245.
MacNairn, J. 106.
Mahan, W. M. 279.
Mallett, M. W. 20.
Manenc, J. 115, 185.
Manjoine, M. J. 368.
Manly, W. D. 189.
Manning, G. K. 287.
Marin, J. 256.
Marshall, M. W. 188, 273.
Martin, D. L. 267.
Martin, M. J. C. 12.
Mason, J. F. 237, 308.
Mathauser, E. E. 371.
Mayer, G. 196.
McAndrew, J. B. 61.
McCormick, W. R. 171.
McDowell, D. W. 204.
McElrath, T. 71.
McGeary, R. K. 275.
McGee, R. L. 287.
McGlasson, R. L. 341.
McHenry, H. T. 368.
McKee, J. M. 271.
McKinnell, W. P. 90.
McPherson, B. 182.
Medovar, B. I. 296.
Mehan, R. L. 116.
Mehl, R. F. 245.
Meinhart, W. L. 269.
Meissner, J. 215.
Melbourne, S. H. 143.
Melcher, N. B. 279.
Meredith, R. 377.
Meyer, F. H. 236.
Michelitsch, M. 349.
Michenry, H. T.
Mietka, M. 353.
Mihalisin, J. R. 224.
Mikesell, R. P. 301.
Mikus, E. B. 258.
Millis, K. D. 112.
Mills, E. C. 140.
Ministry of Defence, 197.
Minkina, E. A. 210.
Miroshkina, E. M. 334.
Mishler, H. W. 289.
Mitchell, D. L. 149.
Moeller, C. E. 220.
Mohler, J. B. 43, 216.
Mond Nickel Company, Ltd. 98, 150, 198, 209, 219, 288, 356.
Moore, D. W. 11, 46.
Morehouse, C. K. 6.
Morgan, A. R. 307.
Morgan, P. A. 237, 376.
Morgan, W. A. 222, 359.
Morris, F. G. 214.
Morris, J. C. 231, 299.
Morris, R. J. 363.
Morrogh, H. 1.
Moss, M. 2.
Mott, N. S. 223.
Mueller, J. J. 60.
Muench, C. F. 288.
Mukhin, C. G. 123.
Munro, B. S. 356.
Murphy, N. F. 40.
Musick, V. S. 21.

Nagayama, M. 90.
National Advisory Committee for Aeronautics, 2, 16, 51, 297, 370.
National Aeronautics and Space Administration, 261, 262, 263, 266, 334, 369, 371.
National Association of Corrosion Engineers, 162, 164, 195, 236, 237.
National Bureau of Standards, 185, 195.
National Gas Turbine Establishment, 68.
Naumann, F. K. 235, 236.
Necheles, R. 61.
Nederveen, C. 96.
Neely, W. L. 112.
Nel, L. G. 57.
Nesbitt, E. A. 358
Newhouse, D. L. 225.
Newkirk, J. B. 245.
Newman, D. R. 282.
Neymark, R. S. 268.
Nielsch, W. 211.
Nielsen, N. A. 90, 303.
Nohl, H. 335.
Norcross, H. H. 144.
Norden, W. E. 310.
Norman, T. E. 285.
Northwood, J. E. 230.
Norton, J. T. 363.
Norton, M. R. 258.
Nowacki, L. J. 303.
Nussear, W. O. 95.
Nutting, J. 209.

Oak Ridge National Laboratory, 152, 190, 229.
Ogburn, F. 282, 283, 323.
Ogilvie, R. E. 279.
Okamoto, G. 90.
Olsen, K. M. 171.
Olson, O. H. 231, 299.
Orner, G. M. 260, 287.
Osipov, K. A. 334.
Osman M. G. 281.
Ostrowski, E. J. 279.
Otley, D. J. 218.
Ott, G. E. 285.
Otto, G. 46, 47.
Owen, L. W. 141, 252.
Oza, B. C. 40.
Ozaki, S. 210.

Paine, T. O. 357.
Palchuk, N. Y. 123.
Panikkar, S. K. 251.
Paret, R. E. 94, 165.
Parfenov, V. A. 84, 85.
Parikh, N. M. 364.
Parr, J. G. 13.
Pasnak, M. 357.
Pateau, L. 250.
Patriarca, P. 376.
Patterson, W. 82.
Pavlov, V. A. 4, 283.
Paxton, H. W. 245, 343.
Pearce, R. F. 245.
Pease, G. R. 98, 204.
Peckner, D. 231.
Pennington, W. A. 112.
Penrice, T. W. 66.
Perks, R. P. 276.
Perriton, R. C. 95.
Perry, E. R. 199.
Peturson, B. 248, 249.
Peveturina, I. A. 283.
Pfeiffer, H. 88.
Pfeil, L. B. 151.
Philip, T. B. 70.
Phillips, J. H. 375.
Phillips, L. E. 305.
Pickering, F. B. 331.
Pickett, J. 106.
Pickles, A. E. 71, 205.
Pier, G. 234, 270.
Pierce, W. J. 146.
Pierson, R. E. 165.
Pigan, E. A. 190.
Piontelli, R. 90.
Pitler, R. K. 367.
Pitt, C. H. 39.
Pitter, R. K. 115.
Piwowarsky, E. 82.
Podlipec, F. J. 236.
Pope, J. A. 217.
Porter, E. O. 286.
Powell, R. W. 2.
Pray, H. A. 25.
Preobrazhenskaya, N. V. 210.
Preston, J. B. 19, 294.
Preston, P. F. 231.
Pride, R. A. 371.
Priscott, B. H. 141.
Probst, H. B. 368.
Promisel, N. E. 331.
Prötzl, M. 49.
Przybycien, W. 2.
Pugh, E. W. 79.
Pugh, J. W. 366.

Quarrell, A. G. 209.

Radavich, J. F. 369.
Ragland, F. J. 191.
Ramanathan, V. R. 142.
Rathenau, G. W. 357.
Raub, E. 75, 214, 352, 353.
Raudebaugh, R. J. 113. 245.
Ray, K. R. 172.
Raynor, G. V. 209.
Rechlin, F. F. 193.
Recht, H. L. 173.
Redden, T. K. 366.
Reddy, A. K. N. 143.
Redmond, J. C. 363.
Reed, R. E. 343.
Reed, R. P. 301.
Reid, B. J. 12.
Reid, F. H. 140.
Resh, S. H. 275.
Reynolds, E. E. 115, 367,
Rhoda, R. N. 140.
Rhodin, T. N. 90.
Richards, C. E. 254.
Richmond, E. M. 367.
Richmond, J. C. 115, 190, 369.
Riddell, F. L. 179.
Riley, B. J. 177.
Rimrott, U. A. 256.
Riott, J. P. 279.
Roberts, H. 52.
Roberts, J. A. 170.
Roberts, S. 279.
Roberts, W. H. 149, 323.
Robertshaw, T. L. 362.
Robertson, W. D. 245.
Robins, D. A. 68.
Roche, T. K. 85, 152.
Roe, W. P. 19.
Roesch, K. 225.
Rhode, H. 49.
Roller, D. 156.
Röllig, H.-E. 187.
Rosene, R. B. 162.
Rosenthal, P. C. 359.
Ross, A. M. 2.
Rousselot, G. E. 77.
Rousselot, R. H. 77.
Rowan, W. H. 145.
Rowe, E. H. 288.
Rowe, J. P. 367, 370.

Rowe, L. C. 197.
Rowe, R. J. 355.
Rozenberg, V. M. 86, 210.
Rozic, E. J. 290.
Rubin, A. I. 184.
Runolinna, U. 218.
Russ, J. J. 220, 337.
Rutherford, J. J. B. 113, 372.
Ruttmann, W. 298, 314.
Ruzek, J. M. 310.

Sachs, K. 143.
Sadowski, E. P. 113.
Safonnikov, A. N. 296.
Safranek, W. H. 9, 145, 303.
Sageau, A. 247.
Sager, G. 2.
Salkind, A. J. 349
Samans, C. H. 272.
Samuel, R. L. 142.
Sampson, M. P. 6.
Sato, N. 90.
Saubestre, E. B. 73, 175.
Sautter, F. 214.
Sawyer, R. 2.
Schab, H. W. 89.
Schaer, G. R. 211.
Schaffnit, W. O. 302.
Scharfstein, L. R. 56.
Scheil, M. A. 304.
Schenck, H. 39.
Scheuerman, W. 151.
Schiller, A. 314.
Schillmoller, C. M. 237, 308.
Schinn, R. 298, 314.
Schmatz, D. J. 327.
Schmidt, D. G. 179
Schmidt, G. 352.
Schmitt, R. J. 93.
Schneider, F. 96.
Schoefer, E. A. 55, 187.
Schofield, F. 2.
Schrader, A. 49.
Schubert, K. 216.
Schüller. H.-J. 271.
Schurin, B. 231.
Schwaab, P. 271.
Schwabe, K. 90.
Schwartzbart, H. 61.
Schwarzkopf, W. M. 332.
Schwenk, W. 234.
Schwope, A. D. 366.
Scott, E. H. 288.
Seifert, R. 2.
Seigle, L. L. 4.
Sellier, E. 310.
Semchyshen, M. 365.
Semmel, J. W. 369.
Serravalle, G. 90.
Setapen, A. M. 124
Seyb, E. J. 145.
Shahinian, P. 18, 106, 368.
Shaw, R. E. 144.
Shaw, S. W. K. 230.
Shea, J. F. 246.
Shearer, A. W. 259.
Sheehan, J. P. 286.
Shelton, D. C. 218.
Shelton, S. 2.
Shephard, S. W. 303.
Sherwood, R. C. 357.
Shewmon, P. 138.
Shinyaer, A. Y. 253.
Shreir, L. L. 144.
Shulman, R. G. 357.
Shul'ts, A. L. 177.
Shyne, J. C. 327.
Sideris, G. 81, 148.
Siebert, C. A. 258.
Siegfried, W. 335.
Signorelli, R. A. 261, 262, 362.
Silman, R. 213.
Silverman, L. 2, 276.
Singh, T. P. 359.
Singley, W. J. 375.
Sivertsen, J. 179.
Sjoberg, J. W. 57, 164.
Slaughter, G. M. 376.
Slowinski, M. F. 124.
Slunder, C. J. 89.
Smart, A. 77.
Smeltzer, W. W. 138, 180.
Smith, A. A. 344.
Smith, A. J. 148.
Smith, D. C. 361.
Smith, D. O. 357.
Smith, G. V. 114.
Snowden, P. P. 92.
Society of Automotive Engineers, 180, 203. 284, 288, 290, 297.
Sommer, K. 8, 144, 165.
Sopher, R. P. 15, 289.
Soppet, J. F. 98.
Sorkin, G. 57.
Sosin, A. 322.
Sotnichenko, A. N. 334.
Sourirajan, S. 173.
Southwell, C. R. 160.
Spähn, H. 323.
Speiser, R. 90.
Spencer, L. F. 215, 310, 376.
Spicer, K. M. 98.
Spretnak, J. W. 360.
Springsteen, D. F. 297.
Sproat, R. L. 189.
Srawley, J. E. 257.
Sree, V. 176.
Stadelmaier, H. H. 216.
Staehle, R. W. 305.
Stapleton, B. 284.
Starke, K. 249.
Starr, C. 2.
Steele, M. C. 250.
Steiger, A. J. 75.
Steiner, J. E. 256.
Steinitz, R. 364.
Stern, M. 235.
Sternheim, G. 90.
Steunenberg, R. K. 248.
Stewart, J. E. 369.
Stout, R. D. 184.
Stover, E. R. 110.
Strauss, S. W. 259, 327.
Streets, G. A. 374.
Streicher, M. A. 163.
Stutzman, M. J. 17, 335.
Sucksmith, W. 12.
Sulmont, A. 343.
Svistunova, Z. V. 295.
Swales, G. L. 59, 196, 198, 288.
Swindeman, R. W. 229.
Szmidt, H. 141.
Szmidt, K. 75.
Szymanski, W. 71.

Takei, H. 246.
Tamhankar, R. 86.
Tanczyn, H. 188.
Tangel, O. F. 246.
Taylor, H. F. 360.
Taylor, R. 186.
Taylor, T. A. 68, 230.
Tebo, F. J. 170.
Templeton, H. C. 309.
Thirsk, H. R. 144.
Thomas, D. E. 374.
Thomas, H. 325.
Thompson, D. H. 341.
Thompson, E. G. 296.
Thompson, J. 119, 342.
Thompson, J. H. 231.
Thornton, A. E. 117.
Thornton, H. R. 190.
Tighe, N. J. 115.
Tipler, W. 88.
Tipoman, M. 322.
Tisinai, G. F. 272.
Title, R. S. 46.
Tomaschow, N. D. 90.
Townshend, B. 286.
Tragert, W. E. 375.
Travina, N. T. 86.
Troiano, A. R. 113, 185, 222.
Troughton, A. G. H. 81.
Trubetskova, R. I. 292.

Uhlig, H. H. 90, 106.
U.K. Atomic Energy Authority, 107, 121, 122, 284.
U.S. Atomic Energy Commission, 2, 23, 85, 98, 149, 163, 170, 248, 295, 296, 302, 306.
U.S. Bureau of Mines, 245, 279.
U.S. Bureau of Ships, 195.
U.S. Naval Engineering Experiment Station, 188, 193, 194.
U.S. Naval Research Laboratory, 18, 160, 257.
U.S. Navy Bureau of Aeronautics, 185.
U.S. Office of Ordnance Research, 51.
U.S. Office of Technical Services, 305, 342.

Vaaler, L. E. 145.
Vacek, J. 247.
Valentiner, S. 38.
Van Delinder, L. S. 161.
Van Dusen, M. 2.
Van Hook, J. O. 248.
Van Houten, G. R. 38, 69.
Van Veldhuizen, H. 210.
Van Vleck, J. H. 357.
Veeriah, K. 39.
VerSnyder, F. L. 362, 370.
Veyrac, R. 247.
Videm, K. 307.
Vinokur, B. B. 258.
Vitovec, F. H. 292, 334.
Vlannes, P. N. 259, 327.
Vosteen, L. F. 89.

Wachtman, J. B. 229.
Waddams, J. A. 227, 340.
Wade, W. R. 334.
Wadsworth, M. E. 39.
Wagner, H. J. 360.
Wagner, V. L. 6.
Waindle, R. F. 170.
Wait, J. D. 275.
Walker, R. J. 96.
Wambold, J. 363.
Wanklyn, J. N. 308.
Warner, J. P. 245.
Warren, D. 232, 233.
Waters, W. J. 261, 263.
Watkins, B. 339.
Watkinson, J. F. 65.
Watmough, T. 373.
Watson, J. F. 280.
Weaver, C. 147.
Weber, E. P. 366.
Weeks, J. 2.
Weeton, J. W. 262, 362.
Weigand, H.-H. 159.
Weik, H. 83.
Weimer, D. E. 324
Weir, J. R. 226.
Welding Research Council, 113, 274.
Wernick, J. H. 169.
Wert, C. 179.
Wessel, E. T. 326.
West, H. J. 144.
West, J. M. 92.
Westbrook, J. H. 363.
Wetzlar, K. 292.
Wheelahan, E. J. 293.
Whelan, M. J. 300.
White, G. K. 138.
White, J. A. 124.
Whitmore, R. W. 114,
Whitney, F. L. 230.
Wiedmann, H. 80.
Wiegand, H. 341.
Wiester, H.-J. 270, 271.
Wiggin, Henry and Company, Ltd. 87, 88, 89, 229, 254, 269, 376.
Wilder, A. B. 372.
Wilke-Dörfurt, U. 325.
Wilkins, D. H. 107, 172, 182.
Williams, H. J. 357.
Williams, J. 67.
Williams, W. L. 188.
Wilman, H. 143.
Wilson, J. E. 53.
Wilson, W. L. 309.
Winchester, C. L. 79.
Wink, W. 80.
Winkler, O. 67.
Wisander, D. W. 301.
Wolf, J. E. 45.
Wood, D. R. 223.
Wood, N. 159.
Woods, S. B. 138.
Worn, D. K. 66, 210.
Wright Air Development Center, 11, 14, 17, 19, 149, 153, 158, 190, 191, 264, 266, 284, 286, 287, 288, 289, 290, 292, 293, 294, 299, 334.
Wright, H. R. 70.
Wright, J. C. 227, 340.
Wulff, J. 110.
Wynne-Jones, W. K. F. 144.

Yankee Atomic Electric Company, 98.
Yeager, E. 174.
Yeager, J. 174.
Yeates, R. L. 144.
Yerkovich, L. A. 153 294.
Yoe, J. H. 211.
Young, J. G. 326, 344.
Yuko, G. A. 13.

Zackay, V. F. 327.
Zajdowski, J. 42.
Zak, T. 75, 141.
Zaletaeva, R. P. 56.
Zeuner, H. 225.
Zibulsky, H. 124.
Zieman, W. H. 358.
Zimmerman, W. F. 224.
Zirinsky, S. 54.
Zitter, H. 233.
Zlatin, N. 328.
Zotos, J. 288.

PATENTS INDEX

Adler, O. E. 28.
Allied Chemical Corporation, 239.
Alter, L. 31.
Althouse, J. G. 30.
Amchem Products, Inc. 132.
American Cyanamid Company, 127.
Anger, E. M. 130.
Armco Steel Corporation, 318.

Bachmann, F. 126.
Banks, R. M. 127.
Bart Laboratories Company, Inc. 27.
Bechtold, J. H. 29.
Becking, D. H. 27.
Bell, R. C. 127.
Berk, F. W., and Company, Ltd., 240.
Binder, W. O. 132.
Birmingham Small Arms Company, Ltd. 28, 31.
Boegehold, A. L. 130.
Borg-Warner Corporation, 125.
Bowles, W. S. 132.
Brazier, J. G. 127.
Brennan, J. B. 125.
British Dielectric Research, Ltd. 27.
British Driver-Harris Company, Ltd. 131.
British Insulated Callender's Cables, Ltd. 127, 129, 239.
British Oxygen Company, Ltd. 125.
Brown, H. 27.
Brush, W. E. 132.
Budd Company, 316.
Bungardt, K. 30.
Bureau d'Etudes Industrielles Fernand Courtoy, 241.

Cape, A. T. 240.
Carman, E. H. 28.
Carpenter Steel Company, 317, 318.
Carr, D. S. 27.
Carrigan, C. E. 317.
Champion Spark Plug Company, 129.
Chesworth, J. 129.
Chrysler Corporation, 27, 29.
Chynoweth, W. 316.
Coast Metals, Inc. 31, 240.
Commissariat a l'Energie Atomique, 32.
Commonwealth Engineering Company of Ohio, 27, 28, 128, 315.
Compagnie Française Thomson-Houston, 29.
Cooper Alloy Corporation, 131.
Coy, C. L. 129.

Davey, E. L. 129.
Davis, G. L. 29.
Dehydag Deutsche Hydrierwerke G.m.b.H., 126.
Delange, M. 32.
Delta - Kühlschrank G.m.b.H., 132.
Deutsche Edelstahlwerke A.G., 30, 317.
Dow Chemical Company, 125.
Drummond, F. E. 28, 128.
Duraloy Company, 130, 317.
Duriron Company, Inc. 132.

Electric Steel Foundry Company, 131.
Esso Research and Engineering Company, 239.
Etabls. E. Jaeger, 129.

Fahlberg-List G.m.b.H., 238.
Fabian, R. W. 316.
Fairchild Engine and Airplane Corporation, 317.
Fink, L. E. 131.
Flint. G. N. 240.
Foreman, J. W. 132.
Fraser, W. M. 132.
Frenchtown Porcelain Company, 29, 128.
Furman, W. F. 317.

General Electric Company, 28, 30, 128.
General Motors Corporation, 127, 129, 130, 133.
Gentry, C. H. R. 29.
Graham, J. W. 133.
Gray, A. G. 315.
Gregg. J. F. 239.

Hadfields, Ltd. 31.
Hanink, D. K. 133.
Hanson - Van Winkle - Munning Company, 239.
Harrison, H. T. 317.
Hayden, W. 31.
Hays, S. A. 127.
Heger, J. J. 131.
Hodge, J. M. 131.
Hoffman, J. F. 129.
Homer, H. J. 128.
Horizons, Inc. 239.
Howards of Ilford, Ltd. 126.

Irish, C. R. 130.

Jatczak, C. F. 316.
Jendrzynski, H. J. 127.

Kardos, O. 239.
Karmitz, P. I. 315.
Kates, L. W. 129.
Keegan, B. 131.
Kegerise, W. R. 317, 318.
Kennametal, Inc. 133.
Köster, W. 317.
Krüger, G. 29.

Lallement, G. 315.
Lanpher, B. T. 317.
Larrimore, R. M. 318.
Lindenblad, N. E. 30.
Linnert, G. E. 318.
Losco, E. F. 29.
Low, S. 316.
Lukens Steel Company, 30.
Luks. D. W. 29, 128.

Mannesmann A. G. 318.
Manufactures de Produits Chimiques du Nord Etablissements Kuhlmann, 315.
Margolis, D. S. 27.
Marsh, P. R. 131.
Marvin, P. R. 27.
Maxted, E. B. 125.
Michael, G. 126.
Middleham, T. H. 31.
Milbourne, C. G. 315.
Miller, E. L. 26.
Miller, S. A. 125.
Millis, W. T. 29.
Mond Nickel Company, Ltd. 129, 130, 239, 240, 317, 318.
Mott, N. S. 131.
Mullard Radio Valve Company, Ltd. 29.
Murray, W. Y. 129.

Nack, H. R. 315.
National-Standard Company, 28.
Neumann, R. P. 239.
North American Aviation, Inc. 127.
Novak, L. J. 128.

Oliver, D. A. 31.

'Patelhold' Patentverwertungs- und Elektro- Holding A.G. 128.
Peppiatt, E. G. 126.
Perkins, R. A. 132.
Pinazzi, C. P. 315.
Polymer Corporation, Ltd. 26.
Powell, J. 128.
Price, E. R. 133.
Puchnin, E. G. 29.
Pure Oil Company, 26.

Radio Corporation of America, 30.
Rait, J. R. 31.
Régie Nationale des Usines Renault, 26.
Reynaud, F. 238.
Reynolds, E. H. 127, 239.
Rheinpreussen Aktiengesellschaft für Bergbau und Chemie, 26.
Riedel, A. 126.
Riedel and Company, 126.
Robinson Bros., Ltd. 126.
Rosenberg, S. J. 130.
Roth, A. 238.
Ruhrchemie A.G., 129.

Sakhatunov, Y. S. 29.
Sauteron, V. 32.
Scanlan, J. P. 31.
Schwarzkopf Development Corporation, 31.
Schweig, B. F. 128.
Shen, T. E. 27.
Siemens Planiawerke A.G. für Kohlefabrikate, 133.
Sienczyk, J. L. 316.
Sintercast Corporation of America, 130, 133.
Skinner, E. N. 240.
Smith, R. 131, 318.
Société d'Electro-Chimie, d'Electro - Métallurgie et des Aciéries Electriques d'Ugine, 238.
Sperner, F. 317.
Steinkohlen-Elektrizitäts A.G., 129.
Straumann, F. 29.
Straumann, R. 29.
Sychrovsky, H. 30.
Sylvania Electric Products, Inc. 129.

Tarr, C. O. 131, 318.
Teasel, R. C. 129.
Telefunken G.m.b.H. 128.
Thompson, S. A. M. 126.
Thomson, R. F. 129.
Tiarco Corporation, 126.
Tickle, W. H. F. 127.
Timken Roller Bearing Company, 316.
Topelian, P. J. 126.
Triffleman, B. H. 316.

Udylite Research Corporation, 27.
Union Carbide Corporation, 131, 132.
United Aircraft Corporation, 28.
United Gas Improvement Company, 315.
U.K. Atomic Energy Authority, 126.
U.S. Atomic Energy Commission, 315, 316.
U.S. Secretary of the Navy, 130.
U.S. Steel Corporation, 131, 316, 318.

Vertes, P. 32.

Wagner, F. C. 239.
Walker, W. A. 127, 239.
Wall Colmonoy Corporation, 132.
Walton, C. S. 316.
Ward, J. O. 31.
Webb, F. B. 240.
Webb, J. P. 29.
Westinghouse Electric Corporation, 29, 132.
Westinghouse Electric International Company, 130.
White, W. F. 316.
Wicker, R. J. 126.
Wiggin, Henry and Company, Ltd., 131.
Winstrom, L. O. 239.
Wood, D. R. 239.
Woolard, T. L. 318.
Worn, D. K. 240.
Wyche, E. H. 131.

Zimmer, F. 241.